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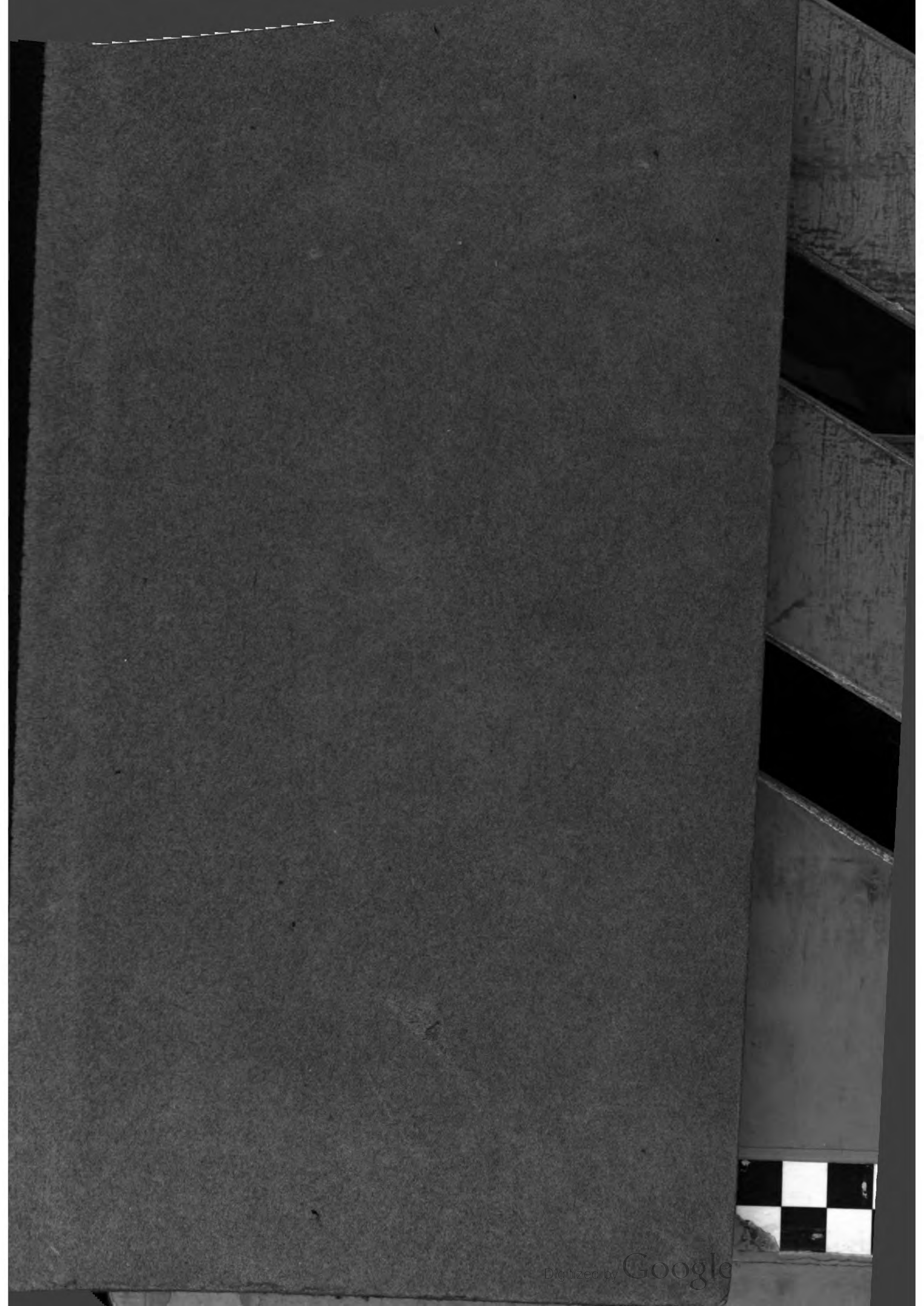
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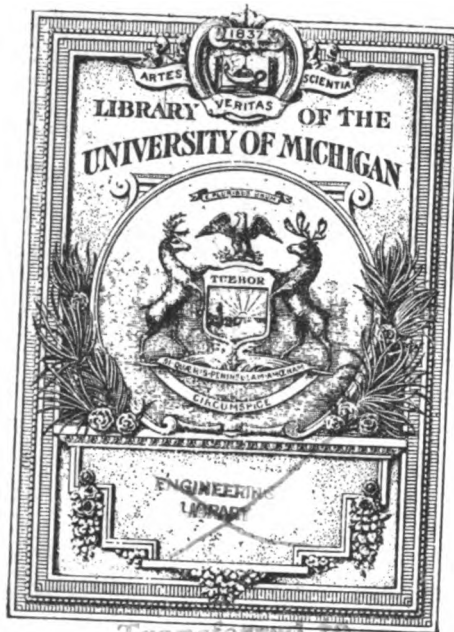
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Automobile Dealer and Repairer

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A Friend in Need

Over a million motorists carry the simple Shaler Vulcanizer for emergency use in making quick, permanent, tube repairs—at home or on the road. It is the greatest convenience ever invented for the motorist.

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Every demonstration makes a sale—because every motorist wants the Shaler 5 Minute Vulcanizer, just as soon as he sees how easy it is to make quick, permanent tube repairs with it. Every sale makes a steady customer for you, as every user will come back for extra Patch and Heat Units to use with his Shaler. Each sale brings a chain of sales on which you make a good profit every month in the year.

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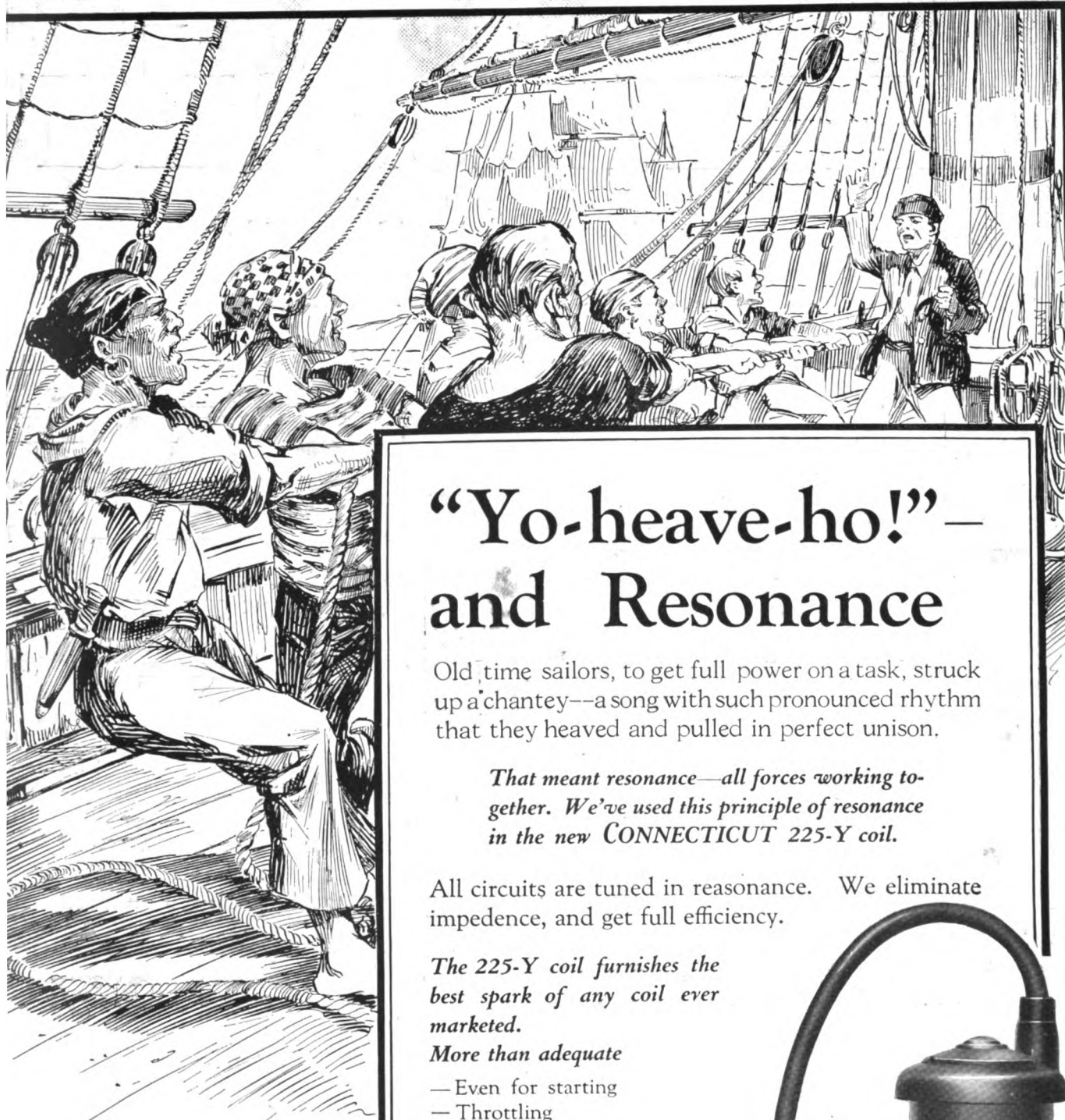
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“Yo-heave-ho!”— and Resonance

Old time sailors, to get full power on a task, struck up a chantey—a song with such pronounced rhythm that they heaved and pulled in perfect unison.

That meant resonance—all forces working together. We've used this principle of resonance in the new CONNECTICUT 225-Y coil.

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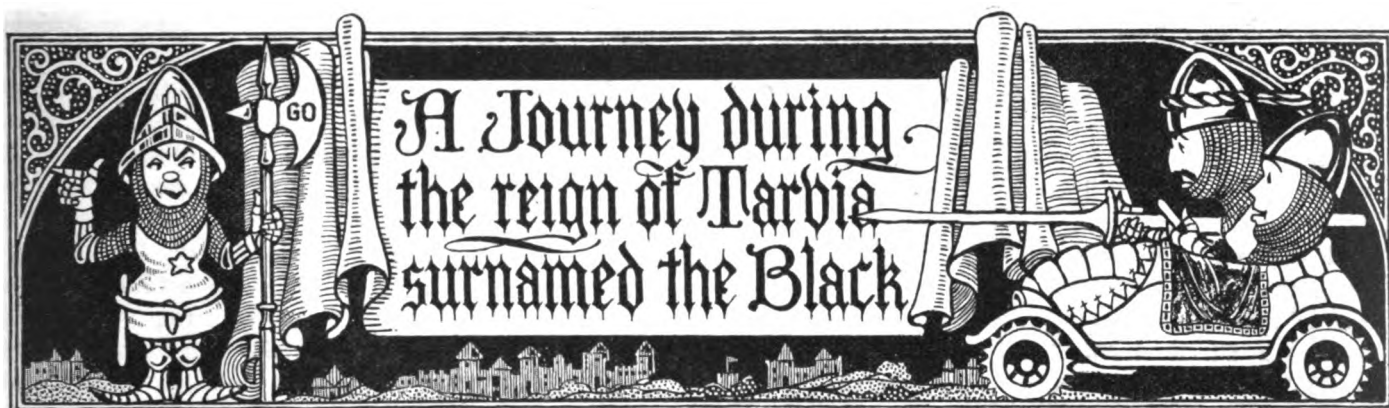
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Foreword

MARK TWAIN'S "Connecticut Yankee in the Court of King Arthur" is so well known, not only as an entertaining book, but also as a moving picture of mirth, that most of us are entirely familiar with the story. The story of the Yankee, wandering through King Arthur's realms is a quaint mixture of sixth century people with nineteenth century customs and the language of both periods.

Now were we to imagine ourselves as living in the fiftieth century, with customs and civilization of thirty centuries hence, it is not difficult to appreciate how old-fashioned our present mode of living might appear.

We might well assume that thirty centuries hence we, or rather our descendants, will be, perhaps, literally living in the air. The automobile of today will seem as antiquated to our great grandchildren as a team of oxen transportation seems to us.

And it is in this spirit that we present the first entertaining chapter of the "Journey during the reign of Tarvia," a story that might well be written by a fiftieth century humorist as a parody upon twentieth century customs.

* * *

Chapter I

NOW in the twenty-third year of the reign of Tarvia, surnamed the Black, Hank Horntooter, being weary of the precincts about his abode, and the high-ways thereof, and the manner in which they were kept, prevailed upon Grezi, his neighbor, to go with him to a far city, even unto Athens, to observe the country and the people thereof. "For," he said, "is not Grezi a strong and skillful man? Peradventure I blow a shoe or have many furlongs to lug gas, will not Grezi prove his worth?"

And it came to pass that Grezi, being prevailed upon to some length, consented.

But Grezi spake as follows, saying, "Take heed that ye have oil in plenty and that your tank be full; likewise that ye have a spare, and see ye do it that it be firmly chained so that it may not be purloined upon the road, for there be troubles enow even when much care be taken."

And it came to pass that all things were arranged even as Grezi had commanded.

Now early upon the second day of the week Hank and Grezi set forth upon their journey and their wagon, called by Grezi a Bus, was of goodly make and not above the age of three years. And when they had traveled a short while, Grezi, because that he perceived a rattle, even to the noise like unto an hundred sabres, desired that a halt be made, but Hank, answering him said, "nay, that rattle is even a part of this wagon and them that have essayed to fix it, in times past, have made it louder, albeit I have parted with many sheckels to them."

And they continued on their way.

And it came to pass that they saw in their road an inhabitant upon a load of wood; and the horse thereof was a veteran of many winters; and the load was in the middle of the road; and Grezi said, "givvim the horn" and Hank gave it him; but the inhabitant remained in the middle.

And Hank put on his brakes; and he performed loudly upon the horn, but the inhabitant gave no sign; and when they had come to a wider place, they essayed to pass, albeit in much danger; and Grezi spake to the inhabitant, using strong language but the inhabitant said nothing, but spat the juice of tobacco toward them and smiled.

And Grezi waxed wroth and said the inhabitant was a road-hog and should be reported; but Hank spake saying, "how can you report a Yap who hogs the road? The time is not yet come when our wise men realize that we have outgrown ancient conditions and that the Bus, by reason of its numbers, should be recognized as the prevailing means of transportation; it is still treated as an intruder upon the highway, having no equal rights; it must therefore be registered and the driver licensed, but the horseteam of our fathers and the pedestrian, not to say all manner of fowl, cattle, sheep and swine may do as in the days of old, even as in the days before the Spanish War."

And it came to pass that, while he was speaking a hen ran across the road and he said "verily, I am in luck for, had I hit her, then would I have been maced for another two sheckels and I have already bought two hens of that woman and still she does not confine them."

And Grezi, answering him said "why should a woman bother to kill, dress and carry to market a hen that she can sell to you at her door for an even price?" and Hank answered no word, being busy with his thoughts.

And while they journeyed, there came suddenly a bump and Grezi yelled, having bitten through his cigar. Hank spake, saying "that was a thankyermarm, didn't yer see it?" but Grezi was wroth and wished the man who built

it was in Gehenna. Hank then said "now must we be passing through an ancient civilization for there be now but few men who have knowledge how to build those cursed things; which only were to be tolerated among a primitive folk; our rulers should abolish them, every one."

Albeit, they soon came upon a road which the king, even Tarvia, had caused to be built; and they had not gone far when the wagon began tilting and rocking even as a ship upon deep waters.

And Grezi said, "Now, had I the man who was foreman on this road, I would put him in prison; he hath had material with which to build a fair and smooth highway, had it been properly used; but he allowed them to dump the stone from the carts and then essayed to spread it smooth and the result ye see, aye, and also feel, for my head is bobbing like a Chinese God's

and my spine feels like a piece of wet string. Now, had the stone been dumped upon a platform of boards and thence spread, a smooth roadway would be here instead of this nuisance." "Thou speakest sooth, friend Grezi, for when the stone has been dumped on the road, a spot harder than the rest has been formed and those spots remain to form the waves over which we are now careering," said Hank.

Now, about this time, there passed at great speed a red bus, made in like manner to them that are used in races; a young man reclined behind the wheel upon the back part of his neck and toyed idly with the steering gear. A roll of paper hung from his mouth even from the lower part thereof and smoke issued at times from his nose; he seemed weary of this old world and his manner was as the manner of one who had lived a thousand years.

"Now is that an escape from an asylum" quo Hank; Nay, good friend," Grezi made answer, "I think that is what men call an Hittite for behold he is only hitting the high places." "He should have a keeper" said Hank; "amen" quo Grezi.

Now as they traveled along, the loud sound of a horn was heard by both and there passed a small car and as soon as it had passed the driver thereof reduced his speed, even until Hank was forced to drive much slower than was his wont; and when he would have passed him, the other speeded up and would not allow it.

"Now, what doth it profit a man, that he act in this manner?" asked Hank. "I cannot tell," said Grezi, "save that he may be keeping the passover, for of a truth he had no other reason to pass in the beginning and when he had passed, his desire ceased; he may be a nut, but it seemeth more that he be a fool" even as he spoke, the other halted suddenly by the side of the road, making no



sign, and applied fire to that which he held in his mouth; "let us haste," said Hank, "for he will soon breathe fire and slaughter; it seemeth me that he meant our destruction, for he halted on a curve making no signal."

And about this time they came in their journey to a place where two roads crossed; and bushes grew on the sides of the road on both corners thereof so that the crossing could not be seen at a distance; and as they came to the other road, a chariot of the people, even a lectricar, crossed their path; and Hank had much ado to pause, lest he be overwhelmed; and the wagon skidded, because of the sudden stop.

And Grezi said, "Wow! Now what chance hath a man to escape collision when bushes are allowed to grow to the height of these?" "Rale not at the bushes, friend Grezi," said Hank, "for I am persuaded that those bushes might cause the saving of many lives." "After what manner?" asked Grezi. "By being cut down, so that the traveler may see the road and what is approaching thereon," replied Hank. And Grezi marvelled at his reasoning.

Now, about this time the wagon, even the bus, began to buck and spit after the manner of a he-cat when it is angry; and they drew up on the side of the road. And when they had cleaned the plugs, she still bucked. And when Grezi was hot and weary with cranking, they got nothing save a few and feeble spits.

And they sat by the road to consider; and Hank went to the car, even to the carbureter thereof, and drew off a full measure; and it came to pass that of this measure, a greater part was water; and when it was drawn off, lo! the bus became as of aforetime and they continued on their journey.

And Grezi said, "Where gat ye this gas?" and Hank made answer, "Of one who sold Navy-Test Gas." And Grezi said, "Wot ye not in what manner Navy gas differs from the other?" And Hank said that he wot not. Then Grezi, answering, said, "Navy-test gas hath salt water, while other sorts have only fresh." And Hank said, "There is an Aviation gas." "Even so," quoth Grezi, "because it hath flies in it." And Hank considered that Grezi was spoofing.

And when they had journeyed for the space of an hour thereafter, Hank drew up another time by the roadside; and they gat down and they had a punktcha; and when Grezi beheld the tire he spake, saying, "Where gat ye this shoe" and Hank made answer, "Of a man who sold retreaded shoes and he told me these are of our own make and of a truth are better than all others."

And Grezi said, "Of what manner was his face?" and Hank answering him said, "Of the manner of those of the sons of Abraham," and the price was also small."

Then Grezi waxed wroth and said, "Verily, thou art a come-on and have wasted your jack, for of shoes there are none too good, even of the best and ye have fallen under the temptation of the cheap-jack. Now, will ye be in luck if this rag bear us unto where a real shoe may be had."

And Hank sorrowed because of his penny-pinching.

And they proceeded upon their way,—but slowly withal, being lame in one tire as aforesaid; albeit they drew nigh unto a truck which was traveling in their way with loud and strident rattlings; and Hank sounded the horn with frequency but the driver thereof kept the truck ever in the road's middle parts.

And when they had traveled thus for above three parsangs and swallowed much vile and stinking smoke, they essayed to pass and were forced to go into the ditch, so that their lives were in peril and as for the bushes upon the road-side they raked the top and left long scars upon the varnish of the body.

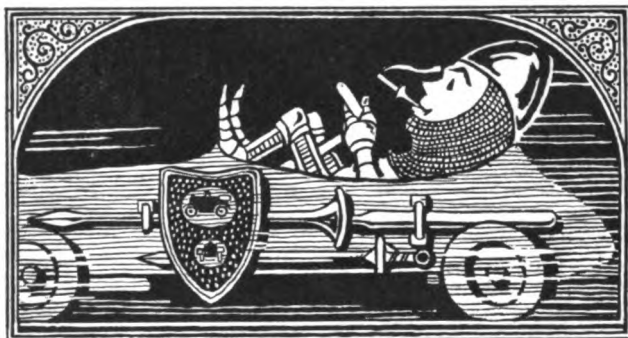
And Hank was wroth and used language; and he spake unto Grezi, saying, "Now have I little to say in favor of these blank, blank, blanked trucks upon the main highways of this kingdom; for behold, they hog the road and the drivers thereof, knowing that they are heavy, have no fear of being bumped; they use the highways for gain and we poor ginks are taxed at every turn to pay for the upkeep of the same; and the drivers, they have store of bad language for him that expostulates with them; and they aid in the escape of criminals so that the king's officers are set at nought in their labors; and they cart hooch, even that which is forbidden that man should carry; and"—

But Grezi interrupted him saying, "Peace, Hank, thou art full of temper; these trucks do, verily, all that ye have said but they perform a public service, in that they move food and raiment for the people."

"Aye, and for a price," quoth Hank, "and were it not for these highways that are maintained by the people, their profit would be small; behold the railroads, both steam and electric, they build and maintain their rights of way; and when the winter cometh, they plough the snow and thaw the ice, all to great loss and they are compelled to keep a schedule, so that all may count upon their comings and goings,

but do these trucks? they do NOT; if so be it the snow cometh, they stay in and venture not upon the roads until others have broken them out; and I say that they return not to the public in service, what they take away in damage—lookit my car" and Hank again brake into loud cursings so that Grezi had much ado to quiet him.

And they came to a gas station; and the station bare



There passed at great speed a red bus

a card on which was written 26 and Hank drew up and a woman came and Hank said, "Give me ten gallons" and she gave it and Hank held forth \$2.60 but the woman said, "Two eighty, please." And Hank said "doth not your sign say twenty-six?" "Verily," quoth the female, "for my husband hath not yet had time to change it; but the price is twenty-eight."

Then spake Grezi, "We have passed many places where they sold at twenty-eight and only stopped here for the reason that thy sign said twenty-six." But the woman only said "twenty-eight." So they paid it, but with a wry face; and Grezi said, "Whaddyer-know? Can you beat it? Ain't that a woman, all over?" But Hank said nothing and ground his teeth.

And after a time, they were passed upon the road by a flivva and Hank lifted up his voice and spake, saying, "Behold the flivva and the owner thereof; for he ariseth in the morning and pumpeth two tires; also, he filleth the radiator, replacing the water that hath leaked out over night; he bendeth the knee and tryeth his oil, least, peradventure that hath also leaked, but of his gas, he careth nothing, for will she not run on a smell? He windeth upon the crank, priming, the while and after much winding, the flivva starteth and maketh a loud noise.

"He getteth upon the seat and performeth with his feet and lo! the flivva goeth forward or back at his pleasure, and no man may see how he does it; he turneth upon an handkerchief while others are backing and filling and is gone from sight, leaving only an objectionable odor; and should it come to pass that he overtaketh a real car, he passeth it if that be his wish.

"He leaveth it out all night and lo! in the morning, it is still there; the rain descendeth upon it and it is not harmed; he seeketh eight others and all ride therein; he goeth far, even unto San Francisco and returneth in time to put the children in school; if he goeth to a garage, he putteth up for a quarter, while I, even the owner of a car, am charged anything up to a dolla; he needeth repairs and findeth them at the five-and-ten; and there be them, still upon the road, that were made in the days of our fathers. Men essay to jest concerning them, but I say unto you they have us all beat."

And Grezi answered from his heart, "You have got to hand it to them." And he told of a man who sold his 1918 flivva for a price greater than that which he had paid when it was new.

Now by this time, night came on apace and Hank switched on his lights; and they came suddenly upon a man walking upon the highway; and they missed him by inches.

"Now what for a cuckoo is that," said Grezi, "that he walketh upon the right side of the road, in the night time, with dark clothing, hath he no fear of death?"

"Marvel not friend Grezi," quo Hank, "this be only one more peril that a driver must face; I have seen upon a summer night, young men and maidens walking, each with arm about the other; and as for due care, they do not take it; and as for anything other than themselves, they know nothing; some time, such as these will be knocked

for two or three bases and men will say that the driver must have had a bun."

"But they might wear something white, whereby one might see them," said Grezi. "Aye," said Hank, "but will they?"

And they came to a City and it came to pass that they beheld a traffic-cop and lo! he was chinning with a friend and he waved his hands in all directions; and when they essayed to pass, and had all but gotten by, the cop suddenly held up his hand; and Hank put down his feet; upon his clutch and upon his brake put he them down; also he yanked his emergency.

And the cop spake unto him saying, "Where learned ye to drive? Don't yer know northern? Didn't yer see my hand?" "Plainly," answered Hank, "and I have stalled my car in my anxiety to obey."

"Wal, getterhell outer this or I'll run yer in," quo the cop; and Hank ground his teeth and pushed his starter, and they came to a garage and it was the time of the evening meal; and when they had driven in, they asked a man having much grease upon his clothing, where they might put up; and he answered nothing; and when they had asked yet two other times, the man said "anywhere" and they discovered an empty stall and after much backing and cutting, had nearly got into it; and the man came and said that the stall was rented and they must get out; and after much labor they were at last put up and Hank charged the man straightly that the tires be blown and that oil be provided, also that the grease-cups be turned up; and the man said that all things should be done, even as Hank had commanded; and they signed the book and departed.

And when the morning was come they went to that place; and they looked for the bus and lo! it was not there; and they inquired of another man where it might be; and when he had also inquired, he told them upon the fourth floor; and he handed Hank a card containing many figures.

And Hank took the card from the menial's hand and examined it and was sorely troubled thereby. So he conferred with his friend Grezi, in low tones, saying this wise: "By what manner of magic thinkest thou this menial hath transported my Bus to the fourth floor and what meanest these figures so cleverly hidden beneath finger marks upon this bit of paper board?" And Grezi rolled his eyes upward, for he knew not what to say or think.

But the person who had tended the card containing the figures did speak, at this and say, "Cammon, Cammon, expect me t'chin widje alday? Itl be just ten bucks tget y'car outa hock; shell out!"

"Zounds but he speaketh full strange," quo Grezi, "but if I mistake him not, his palm itcheth for much coin of the realm, which thou must pay ere thou seest thy gas buggy again." So Hank tooketh from his purse the money, though it grieved him sore to pay so much for on night's lodging for the Bus.

And when the person with the soiled collar had re-



ceived the ten bucks into his hands he did perform upon a machine of gold which stood in one corner of the room, he did push upon a number of glassy buttons and a bell did ring and a draw did open and the figures \$ 8 6 2 did appear in a frame at the top.

And Hank did remark upon this, that whereas the person had required but ten simoleons, 862 had been placed in the little draw beneath.

But the menial explained that the numbers did mean nothing of any importance, so Hank was satisfied.

The person did then put his lips to a small tube, which was at the side of a door and did blow and after an

interval a small voice came from the tube demanding what were his wishes. "Truly," quo Hank, "this man is a great magician for he speaketh with the Gods and they bow to his wishes." "Thou speakest truly," answered Grezi, "let us see if his commands are obeyed," so they waited in silence.

Soon a door was opened into a room at one side of the building and behold the Bus was there and both Hank and Grezi marvelled greatly at this piece of magic which could so rapidly move so great a machine upward or downward at will.

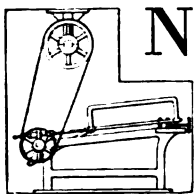
And then they journeyed forth.



Home Made Bushing Stock

Detailed Description of a Method
Which Has Proved Successful

By David Baxter



NUMEROUS methods have been devised for the casting of brass or babbitt bushing stock. All of which are more or less convenient. But some of which do not produce entirely satisfactory results in so far as clean, solid metal is concerned. It will therefore pay in the long run to employ a system that is not quite so crude as are many of these devices.

And it is the purpose of this article to describe in detail a method that requires a few more tools perhaps, but which is entirely successful in every way if the work is properly carried out. In fact it is patterned after a system that has been in use for many years. In other words we might say it is borrowed from the foundry and changed enough to be entirely adaptable for use in any auto repair shop or machine shop. And can be easily mastered by the average mechanic.

First let us list the supplies and equipment needed. Then give a description of each item. Followed by detailed instruction for doing the work.

The former includes a quantity of river sand such as is used in mixing mortar or cement. Say twelve quarts, run through a medium fine sieve. Also a quart of common bread flour. These are for the purpose of making what is known as the core for forming the hole through the center of the bushing.

Next on the list is a quantity of molding sand, say several bucketfuls; which may be obtained from any foundry. But if this is not convenient, common sandy earth such as is found in the garden will serve. It should,

however, first be burned to remove all vegetable matter like grass roots or seeds, and moistened to a consistency of freshly plowed ground; and sieved to produce fineness. This dirt is to form the mold or outside of the bushing.

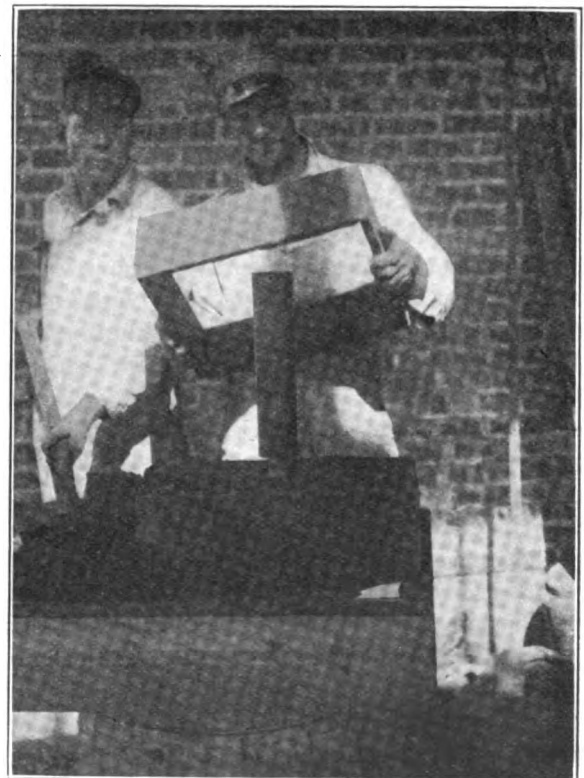


Fig. 1. The first section of the mold with the pattern in place.

After these supplies, comes the equipment, which includes first, the core box, which is made by clamping two pieces of soft pine 2 x 4 together and boring a hole the desired size from end to end of them so half of the hole will be in one 2 x 4 and half in the other. This hole should be perfectly straight and smooth and of exactly the desired size. In fact there should be several core boxes with different sized holes; all of which should be sand papered and shellaced to give best results.

An examination of the accompanying photos will aid materially in making the core boxes. An accurate core box is very essential, as it is in reality the mold for the core; which forms the hole through the bushing.

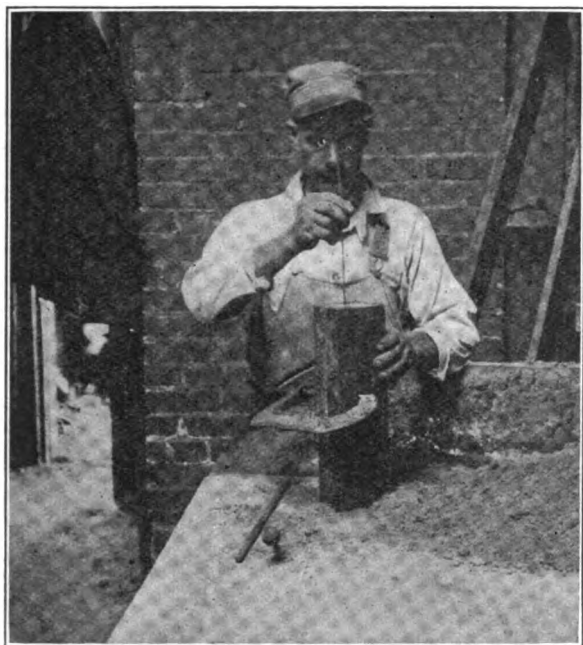


Fig. 2. Drawing the pattern from the completed mold.

Next is the bushing pattern. In fact there ought to be several patterns of various sizes, in order to be able to make different sized bushings. Thus saving a deal of metal and machine work. The length is not so particular but a foot is a good standard.

The pattern is really in two parts, viz.: the pattern proper and the core print as is shown in Fig. 1.

For the sake of simplicity let us specify as to size. Then, the pattern is made by turning down a 4 x 4 of soft pine to three inches diameter. Which is accomplished quite readily on a metal lathe if no wood lathe is available. It should be turned smooth and be well sand-papered. In the exact center of one end a quarter inch hole is bored about two inches deep. This is for the purpose of attaching the core print to the pattern; or for making the core prints interchangeable.

The core print is for the purpose of forming a cavity in the bushing mold to hold the core in the center of the mold when the bearing metal is poured. It is made of a smaller block of white pine turned out on a lathe. When in place it is literally an extension of the pattern proper, and is attached by a wooden pin in the hole bored for this purpose. This core print should be very smooth and fit snugly to the end of the pattern body. Fig. 1 also shows

the core print at the bottom of the pattern, resting upon the molding sand in one of the molding frames.

Next on the list of equipment is the mold frames. These are made of 1 x 6 planks sawed and nailed in the form of a square. The frames are also shown in Fig. 1 of the illustrations.

Now let us see how the bushing mold is made: First place one of the mold frames flat upon a bench or the floor. Fill it with the moist molding sand after being certain it is not too moist. Press the molding sand firmly in the frame and strike it level with a strip of wood or the edge of one of the other frames.

If the molding sand is too wet the molten metal will boil and fuss, perhaps be blown entirely out of the mold.

After the sand is struck level place the pattern upon it with the core print downward. And then place another frame section on top of the first, around the pattern. The operation is clearly indicated in Fig. 1.

Fill Second Frame

Fill this second frame with molding earth, firmly tamped down with the shovel handle, being sure to tuck it around the core print and beneath the lower end of the pattern. This earth should not be rammed heavily as it will tend to make the molten metal boil when the mold is poured. Which often results in a porous or dirty bushing. However, on the other hand if the mold is not firm enough the bushing will swell in the soft spots.

Now, the third frame section is placed on top of the second and well filled with firmly pressed molding sand. This last section should now be level with the top of the



Fig. 3. Making the sand core; note the clamped core box.

pattern. The surplus earth is scraped off flush with the top edge of the last frame. The mold is then ready for the pattern to be drawn.

Moisten the earth around the pattern with a little water dripped from a sponge or a handful of waste, not too much water; just enough to keep the molding sand

from crumbling when the pattern is drawn. Then insert a sharp spike in the top of the pattern and rap it lightly sidewise in all directions to loosen it so the drawing will be easy. Then with the same sharp spike or with a long screw, the pattern is carefully and slowly pulled out of the mold.

It should be rapped lightly as it is drawn, to keep the sand from adhering to the pattern around the core print. Fig. 2 shows the completed mold with the pattern being drawn out.

Preparing to Insert the Core

We now have the finished mold ready for the core to be inserted. It is nothing more or less than a cavity or impression the exact shape and size of the pattern and core print. The core print leaves a smaller impression at the bottom of the mold, into which the core can fit so it will be held in the center, to insure the hole being through the middle of the bushing.

If the pattern and core print is not smooth it may leave a little loose dirt in the mold, which should be cleaned out before pouring in the molten metal.

Before describing the setting of the core let us first see how it is made: The twelve quarts of river sand and one quart of flour are thoroughly mixed, so that every grain of sand is in contact or covered with the flour. This is in ratio of twelve to one so that the total quantity may be decreased or increased if the proportions are maintained.

After mixing, the core sand is moistened a little at a time until it will hang together when packed but still not be wet enough to be sticky. This is much a matter of experience so the novice may have to practice some before he is able to judge the proper moisture content of a batch of core sand. The proper wetness may in reality seem

very dry to the beginner. If it is too wet the core will not roll out of the core box but will flatten out or crumble.

When the core sand is right, the two halves of the core box are clamped together as shown in Figures 3 and 4. A common cabinet makers clamp is used. The clamping should be done on a level surface of the bench.

After the clamping, a handful of the core mixture is dropped into the core box and tamped firmly down with



Fig. 5. Rolling the core out of half of the core box onto the drying plate.

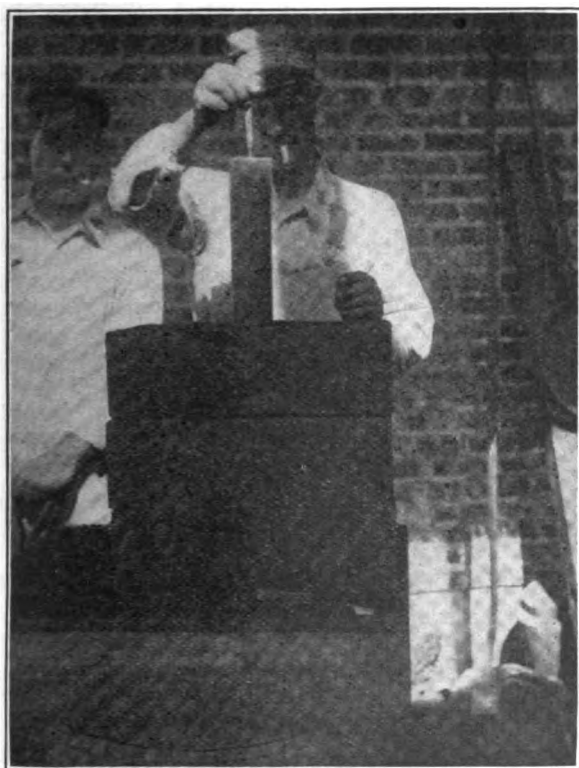


Fig. 4. Pushing the vent wire through to the completed core.

an iron rod, as is indicated in Fig. 3. Then another handful of sand is dropped in and tamped down. Then another and so on until the whole length of the box is tamped full. The sand is put in a little at a time in this way to insure an evenly packed, solid core. Then the top end is pressed and rubbed smooth with the fingers.

The next step of this process is shown in Fig. 4. This is what is called venting the core and consists of pushing a fair sized hole through the column of sand before removing the core box. The large, perfectly straight wire is pushed down with a twisting motion through the entire length of the core, and then carefully pulled back up again with the same twisting movement to leave a clean round hole.

This venting is absolutely necessary, as it is the only means by which the gas can escape from the core. When the flour binder burns it must escape in the form of gas, either through a proper vent or through the fluid metal. The latter course nearly always results in ruining the bushing.

Now the next step is where the novice nearly always falls down. At least his success is almost sure to be poor the first few trials. It is the getting of the core out of the box upon the plate to dry. However, the box is rapped smartly but lightly to loosen the core. This is done before removing the clamp. Then the box is held tightly with one hand while the clamp is removed. After which the box is turned horizontal and the upper half lifted off. Then the box is held with both hands to the edge of a square, flat plate of cast iron as is indicated in Fig. 5. And the core is slowly and evenly rolled out upon the plate. The mechanic can soon learn to do this dextrously.

The plate is what is termed the drying plate. For the core is placed in an oven or over a fire on this plate and dried or cooked until it is firm and brown. In fact the core is better if it is burned a little. That is, it is best when dried almost black; not burned enough to be crumbly, however. This excessive drying eliminates a great deal of the gas caused by the burning flour; the flour

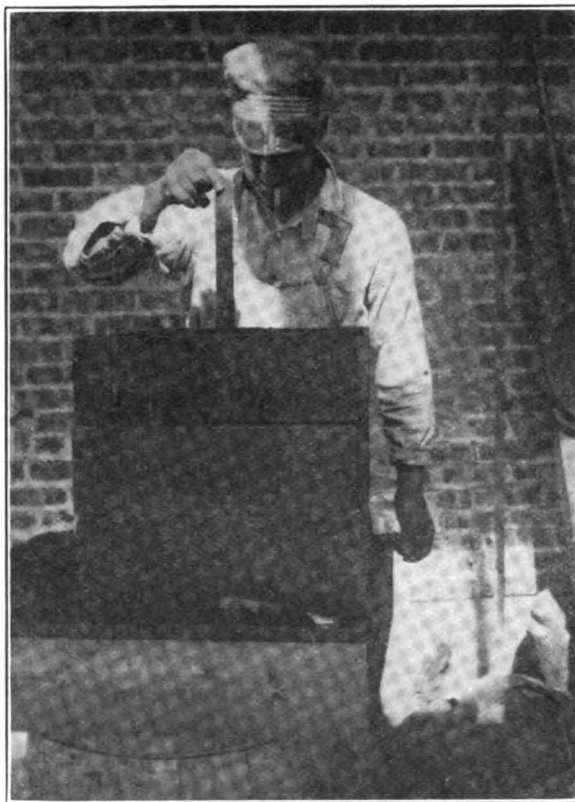


Fig. 6. Lowering the dried core into the mold.

burns when the molten metal is poured around the core. The core should be a little longer than the pattern and print so it will stand above the mold, say about a quarter of an inch. When it is cold enough to handle it is lowered into the mold as shown in Fig. 6. Being sure it enters the core print mold at the bottom of the bushing mold. Also being sure the vent hole is free from obstruction and that no metal can enter it at the bottom. If the molten metal enters the vent it is liable to shut off the gas escape and cause the metal to blow hollow.

Then a weight is arranged to hold the core in the center

of the mold at the top. The weighting arrangement should be such that it will not only center the core at the top but will prevent it from floating when the molten metal is poured into the mold cavity around the core.

The mold is now ready for pouring, which should be started slowly and finished rapidly if babbitt or other composition metal is used.

When the metal sets hard enough to handle the mold is torn apart and the molding sand moistened and preserved for future use. It may be used over and over indefinitely.

The core, however, can not be used again, so it is well to always have on hand several cores of different diameters, for use in rush jobs.



TIRE CHAINS

THERE is no such a thing as a non-skid tire! Neither is there such a thing as a non-skid device for the wheels of the automobile any more than there is a theft proof lock or a 100 per cent. perfect measurement, or 100 per cent. efficiency. Perfection in anything is unknown.

The matter of skidding is purely one of conditions. A non-skid tire may prevent skidding while the car is operated on a smooth, hard road, but drive into a moist snow-bank and the tire fills up until it is as smooth as a piece of ice. A sticky, clay soil too, will fill up the non-skid surfaces of a tire and the driver is helpless. Then tires cannot be depended upon to prevent skidding under all conditions.

Now although chains or similar devices *do* prevent skidding under normal conditions, even these cannot always be depended upon. If the whole road-bed slides, then the car goes with it and so when you drive either with non-skid tires or with chains, do not forget to be cautious.

Tire chains will, under most conditions, prevent skidding if they are correctly applied. The average driver is prone to apply chains in correctly and if you will listen at a well traveled road on a "chainy" day you will hear this fact plainly. The rat-tat-tat of a loose or broken chain is very common as is also the buzz of a set of tight chains. A set of properly attached chains will give a metallic whirr.

Chains should be attached to the tire loosely but not so much so that they will bang against the mud-guards. If the chains fit the tire perfectly they will not always prevent skidding and they will wear the tire.

It is also necessary that the cross chains be all of the same length, so that if you make repairs to them, be sure to observe this fact.

DEFINED

WILLIE WILLIS: Pa, what's a "hick town"?

PAPA WILLIS: It's a town where you can get tomorrow's New York paper with yesterday's news to-day.

—Life.

Thirty Miles on a Gallon

Engine Efficiency Depends Upon Two Things The Mechanical Parts and the Operator



FROM time to time we read of automobiles which operate as high as 40 miles to a gallon of fuel, but mostly these spicy bits of literature are fresh from the press of the car manufacturer. Our own friends usually obtain 30 miles in their stories but when we journey with them the cars do not seem to act their best and our friends are prone to make excuses. But there must be a foundation to such startling rumors.

As the writer reads over the numerous "trouble department" letters he is startled by some of the mileage facts presented. One man who owns a Dodge car, for instance and lives in Maine claims a mileage of 18 to a gallon while another man from Ohio, owning a similar make of the same year says his average is 22 miles to a gallon. How does he do it?

The Ford car range is anywhere from 15 to 25 miles per gallon; the Oldsmobile runs from 8 to 15; Cadillac from 6 to 10; Hudson from 10 to 15 and so on. The smaller mileage rates indicate a tremendous waste of gasoline; the larger mean excellent efficiency.

The difference in mileage per gallon in different cars may not seem to amount to very much, but if one were to figure costs, one would realize the importance of efficiency in engine operation.

Let us assume that an average season's running is 3000 miles; most of us manage to work our speedometers to about that point each season. We will consider the Ford car as an example because it represents the smallest waste of fuel.

We have records which show a fairly large number of Ford cars giving as low as 15 miles per gallon; a few even lower than this. At this rate the season's run of 3000 miles consumes 200 gallons of fuel, which at 25 cents a gallon, means a cost of \$50.00.

Satisfactory Operation

On the other end of the scale we find a number of Fords giving a mileage of 25 to a gallon. The season's run would mean 120 gallons; cost \$30.00; or \$20.00 less than the first car considered. Now \$20.00 would go far to make repairs, or if saved would keep one in tobacco for many months. And gasoline is not always as cheap as 25 cents a gallon, unfortunately.

But the difference is not all in gasoline efficiency. A car which gives high mileage per gallon also gives more power, more rapid pick up, and causes less carbon trouble with attendant evils than one with low mileage efficiency.

High mileage per gallon of fuel depends upon two things; the condition of the car and the skill of the driver. To a certain extent road conditions and the

typography of the country make a difference. But the latter cannot be considered. What we really want to do is to put our cars in the best condition for efficiency in our part of the country. And we also want to know how to drive the car to obtain the best efficiency in it.

In considering this problem we will first discuss the matter of mechanical construction.

The carburetor naturally is of primal importance. A fraction of a drop at the spray nozzle means a few gallons in the course of a week. You know the old statement about, "little drops of water which make the mighty ocean" and so on. And much of our gasoline today is of this "little drops of water" variety.

Now there are two ways in which you can control the fuel at the spray nozzle, you can cut down on the needle valve or you can let more air into the engine. In the cases where a fixed spray nozzle is built into the carburetor you are limited, practically, to the last mentioned way.

Rich and Lean Mixtures

Unfortunately you are often prevented from cutting off some of the fuel or letting in more air by the demand of the engine for the fuel. This demand is greater at low speeds than at high. An engine may require a rich mixture for starting and yet will run on a very lean mixture at high speeds.

If the carburetor has a needle valve for controlling the spray nozzle, then the problem is a simple one. Provide some means of controlling this valve from the driver's seat. Make a habit of turning off the gas as far as possible when the car is running at medium and high speeds. The writer might quote the Hudson car as an example of what can be done along this line. This car is fitted with a gasoline spray nozzle adjustment on the dash.

In a test made with an adjustment which allowed the engine to operate smoothly while idling the car averaged 13 miles to a gallon. Over the same test run, the same car averaged 15 miles per gallon, with careful attention to this adjustment. The gas was cut down when the car attained a 15 mile per hour rate and enriched only when it was necessary to throttle down or throw out the clutch. The engine would stall if the clutch were released and the throttle closed, yet it would pull normally at 15 miles an hour or over.

If it is not convenient to install a needle valve control, one can tap a $\frac{1}{8}$ inch hole in the manifold, between the engine and the throttle, butterfly valve and fit it with a length of copper tube. The tube may be carried up the steering column and a pet-cock placed on the end. By opening the pet-cock air is admitted to the engine and since the latter can draw in only a certain amount of gas, less fuel is used.

If this same copper tube can be connected with some sort of a water feeding device, a steam engine sight feed oiler for instance, then water vapor can be admitted with the air and a double purpose served. The water should be shut off, however, a few minutes before the engine is stopped, else it may tend to corrode the cylinders.

Second to the carburetor, in gas efficiency, comes the ignition system. A poor spark in the cylinders results in a waste of fuel. If the spark is thin, and has little heat in it, it will not ignite the fuel readily. The fuel will burn slowly and be forced out through the exhaust before it has been completely consumed.

Spark Advance Mechanisms

Those of the readers who have been in the automobile game for the past 15 years realize what has been happening in regard to spark advance mechanism. Fifteen years ago the majority of engines were timed to explode with the spark at top dead center, nor was it thought necessary to provide a further advance. Yet today most engines are timed to fire at top center with the spark fully retarded. All of this because with thin, poorly mixed fuel we need to start it burning far ahead of the time when we need the explosion. And unless we give it a good, hot send off with a "jazzy" spark, then the engine is sluggish and lacks both power and pick up.

And there is a great difference in ignition systems. The gap between a good system and a poor one may represent the loss of three or four miles to a gallon of fuel and the dropping back into low gear on ordinary grades.

We know of no ignition system, commonly used as stock equipment, on modern automobiles which is inherently bad; in fact we might state that all of them, barring any individual mechanical defects, are good enough and give satisfaction when new. But after a while they begin to go bad, many of them, and the car owner becomes discouraged with his car. Mileage is low, engine lacks power and skips like a scared rabbit.

Chances for Wear

If the system was all right to start with, then there is no reason why it cannot be kept in condition, for there are but two places for wear in the life of the unit; we refer to the contact, or breaker points. True the cam may wear, the points may burn, and so on but as a general rule the unit will last as long as the engine, unless it is misused.

And so, if you would obtain good mileage from your car look to the ignition breaker points. Keep the points clean and flat at all times; give them the "once over" every month and you will have little trouble.

The spark plug electrode adjustment is another place where fuel may be saved or wasted. The electrodes will burn away and thus increase the spark gap. The wider gap will cut down the heat of the spark and then the efficiency falls away. There is no set rule for plug adjustment, different systems require different gaps and you must consult your instruction book. But don't try

to get away with the idea that you know more about the adjustment than the manufacturer. Do as he says and you will work toward gas economy.

The third thing of importance in economical gas engine operation is the valve adjustment. A bit of thought will lead anyone to the realization that the engine will not work properly unless the old gas left from the explosions is removed. Fresh new gas will ignite quickly and give a snappy explosion, and, naturally its maximum power. But if this new gas is diluted with old, burned out gas its flame propagation speed will be diminished and its power decreased.

Exhaust valves must be adjusted to open their maximum and the valve clearance cut to a minimum. But, on the other hand, if the clearance is too small, then the valves will stay open and the explosion will escape through them. Adjust the valves then!

For the same reason the exhaust line must be clean and the muffler kept open. If you want to prove these facts just stuff the exhaust tube with a bit of cotton waste and watch the engine die. And it doesn't take much back pressure from the exhaust line to cut the horse power in half.

Valve Action

Rapid, clean and sure valve action is essential when considering economy. A weak valve spring will cause a loss of power just as surely as a dragging brake band. You can test the strength of the springs by inserting a broad screw driver between the coils and giving it a partial twist. If the engine speeds up, or runs more smoothly than before you can be certain that a stronger valve spring will help matters.

It seems almost unnecessary to remark that the rings and valves must be tight enough to prevent the escape of the gas, though not every motorist fully realizes the fact.

Leaks around the valve stem not only tend to reduce the efficiency of the engine but cause uneven engine action. To compensate for such leaks one must open the needle valve further and thus use more fuel than would be necessary were there no leaks. Such leaks are not harmful at high engine speeds, but invariably cause trouble and waste of fuel at low or normal speeds.

With the various kinds of friction and the chances of loss of power we have not space in this article; suffice it to say that you cannot expect high mileage efficiency if the brake bands are dragging.

This brings us to the matter of skillful driving. The good driver is frequently able to obtain several miles per gallon more than a poor driver and the skillful one not only obtains the mileage but his machine lasts longer, gives more power and causes far less trouble than the car of one who does not know the finer points of driving.

With straight waste we need not deal. We need not mention the chances of waste in an engine running idle. But an engine running always consumes fuel whether the car is standing idle or being operated on the road.

Of course it is impractical to stop the engine every time one throws out the clutch for if a driver must do

this he might just as well take a trolley car or walk. But there are times when coasting without the engine pays.

If one gets into the habit of coasting down hills and grades one can save much fuel. One can estimate, very easily, the distance one may coast down a hill, for instance, and govern himself accordingly.

On a long hill it certainly pays to throw out the clutch and either throttle the engine down to its minimum or stop it altogether. If the latter course is adopted then it is advisable to leave the gears in either high or second and thus be prepared to use the engine as a brake, or to start the engine when the bottom of the hill is reached. In the same way it pays to coast up to the curb when one decides to stop.

Too rapid acceleration wastes a lot of fuel besides causing the passengers considerable annoyance, and for this reason one should drive evenly rather than by "fits and starts" as so many drivers do.

At this point we might well speak of something which we mentioned a few months ago, the matter of using the service brake with the clutch engaged. With the engine throttled to its lowest it acts as a brake down to the idling speed, below that it gives power and the brake simply works against the engine and both units are straining against each other. But more than this, the engine consumes more gas than it would were it running idle and free.

There is a peculiar fact about any power developing machine; the machine will run idle upon a certain amount of fuel and if a load is put upon it, it will immediately absorb more of the fuel up to a certain point. In the

gasoline engine this fact is not so very clear, in fact the amount of fuel absorbed by an engine, under a load, working on a closed throttle, is but very little more than the same engine running idle with the closed throttle. But we are mentioning all the points where there is the least chance for waste.

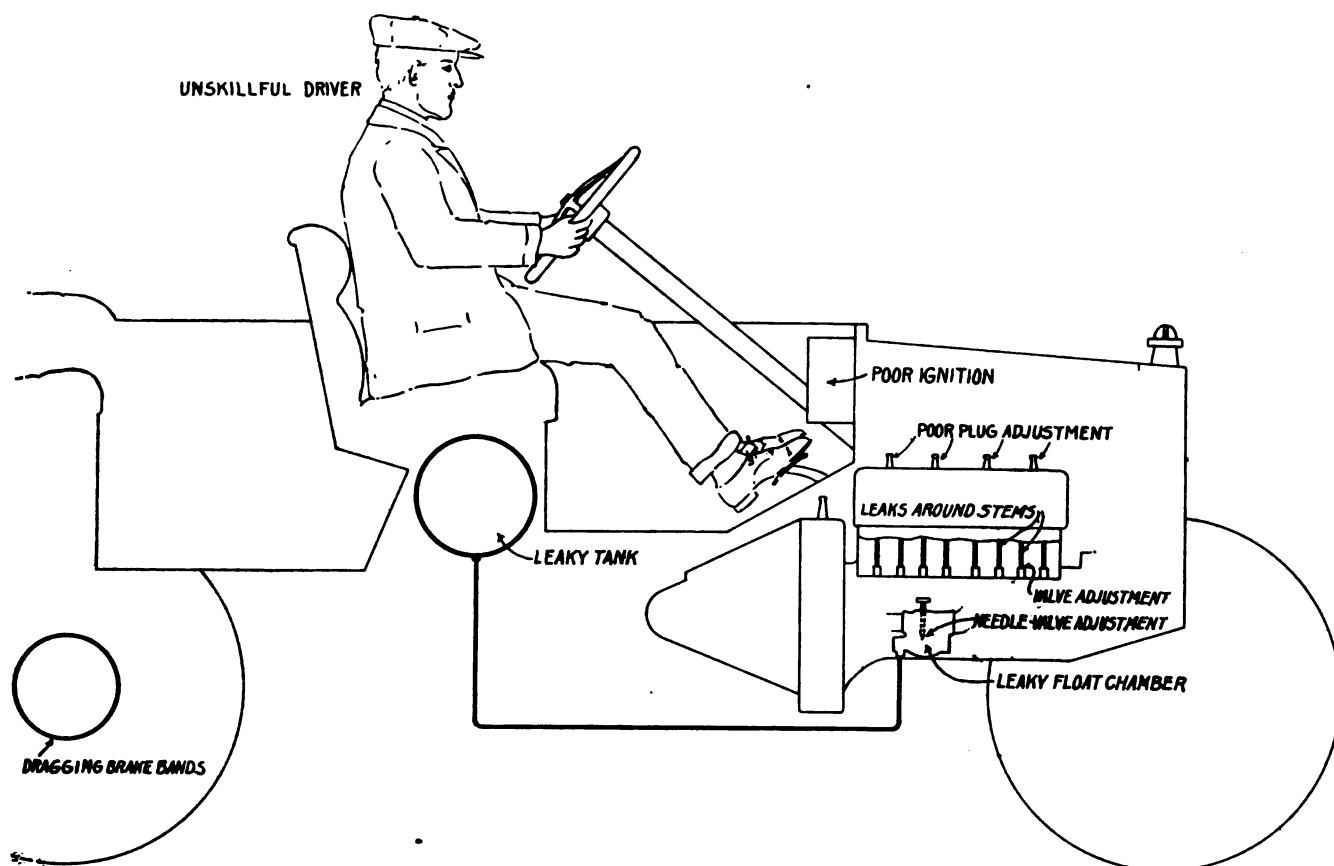
A good example of this absorption fact is found in the electric motor. The motor will run at 1800 r. p. m., for instance, idle and consume five amperes of current; put a load upon it and the amperage which it draws will be greater in proportion to the load and this without changing the size of wire or the controlling resistance.

There are still a large number of cars which are not fitted with automatic spark advance mechanisms and the operator is forced to advance and retard the spark in order to get the full efficiency of the engine.

Many drivers think that the spark should be advanced as soon as the engine is started and left in that position until it becomes necessary to crank the engine again; this idea is a fallacy for the spark lever is almost as important as the throttle.

There is one point in each piston stroke where the spark should occur for maximum efficiency. If the spark is advanced so that it occurs before this point, then a large amount of the force is expended in forcing the piston backward and the engine pounds. If the spark were advanced beyond this point, and the valves were to function properly, the engine would run backward.

On the other hand, if the spark is retarded too much, then the force of the explosion is lost through the exhaust



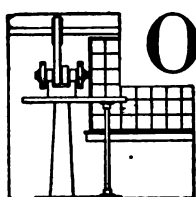
Sketch showing various elements entering into conservation or waste of fuel.

valve. In other words, if the spark occurs at the wrong time, then fuel is wasted. In one case the engine is strained, in the other it is overheated.

While the spark position is relatively unimportant with the throttle closed, it is vastly important with the throttle open. A skillful driver can put a car over the top of many hills, in high gear, upon which the amateur would be forced into low speed, simply because he would know how to control the spark lever.

Experience only will show the driver where the spark should be kept under certain conditions. Roughly speaking it should be kept almost as far advanced as possible without causing the engine to knock. The speed of the engine determines the point.

In closing we can say one thing, keep your engine properly adjusted in every way, while driving, give all controls your constant attention, for in this way only can you hope to get full efficiency from the fuel.



OF all the small tools in a garage, the vise is undoubtedly the most important. As a matter of fact it would be impossible to do repair work without such a tool. It is the first small tool that the repair man should contemplate and the more he can get in the way of such a tool, the

better the investment.

We feel that our choice of the Stewart Handy Worker, made by the Chicago Flexible Shaft Co. of Chicago, Ill., is a wise one, for in this tool we have not only a strong, serviceable vise but an all around machine shop in itself.

As a vise, the Handy Worker is an excellent tool and is plenty heavy enough to carry ordinary repair jobs within reasonable limits. The tool has a weight of approximately 80 pounds and is made of fine grained cast iron.

The jaws are four inches in width and approximately two inches in depth and are fitted with steel faces. The back jaw is cast integral with the upper part of the body and is unusually heavy for its size.

The feed screw is located at the back of the vice, instead of the front as in the conventional design and this

screw is fitted with a 5½ inch handwheel, which operates upon a 7⁄8 inch feed screw of fairly low pitch.

The front jaw extends down almost to the bottom of the whole machine and is mounted upon two one-inch cold rolled steel rods. The latter slide into holes in the body and guide the jaw. It is easy to see that a fairly accurate adjustment may be obtained, since the fitting of the bars to the body is much easier than the fitting of a large sliding member would be.

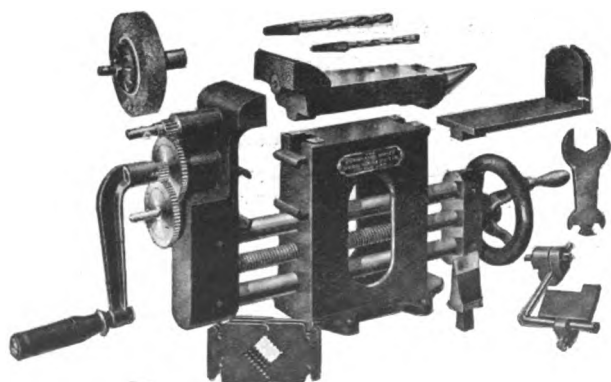
The length of the feed screw and the bars permits an opening of 4¼ inches between the jaws, though this is far from the limit of the machine as will be seen later.

The back jaw of the vise is prolonged to form a steel faced anvil with a saddle at the end and a square hardy hole. This jaw, together with the anvil is fitted with three square projections which fit into square holes in the main body of the tool.

By opening the vise slightly the back jaw and the upper part of the body can be slipped forward and removed, leaving a flat surface. Upon this flat surface fits an angle plate, which is held in place by three square projections. With the angle plate in place a wide range vise is formed, capable of taking 12 inches in width between the jaws. Thus the vise has a range of from zero to one foot in width.

With this sort of construction the repair man may utilize the tool to grip practically any reasonable length for he can easily bend up an angle plate from flat iron. In our shop we have clamped together pieces aggregating nearly three feet in width, something which could be done only upon a tool with a removable back jaw.

Both the front jaw and the main body of the machine carry a pair of projections into which fit a set of steel pipe jaws. The opening between the jaws is such that they will grip 1½ inch pipe or its equivalent.



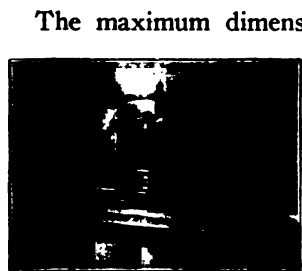
The Stewart Handy Worker

The front jaw carries a rotating spindle which is fitted with a threaded end on the inside as well as a square hole. The threaded end of this spindle fits into an arbor which in turn carries a $4\frac{1}{2}$ inch emery wheel.

Beneath the spindle, on the front of the jaw, are two sets of reduction gears, so arranged that a hand crank may be applied to either set or to the spindle itself.

By this means three sets of spindle speeds may be obtained, 14 to 1; 4 to 1; and a direct drive. These various speeds being used for driving the emery wheel or a square shanked drill which can be placed in the sprindle.

The grinding wheel may be removed from the arbor and a polishing or buffing wheel put in its place; in fact the machine is really a small lathe in its way and the mechanic will soon find that it has hundreds of uses.



"Cutting Off" with the Handy Worker

The maximum dimensions of the tool are 25 inches long from handwheel to front of jaw, 12 inches high and 7 inches wide. It is designed for fastening to the work bench with four bolts or lag screws. In our case we have mounted it upon a heavy oak block and so arranged the block that it may be swung

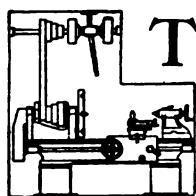
around on a swivel.

Not only is the Handy Worker a garage or repair shop tool but it should be of interest to every car owner. The device has so many uses that it should form a part of the equipment of every man who "tinkers" about the house or shop.

The various illustrations accompanying this article will serve to give the reader an idea as to the utility of this handy, unit machine shop.

MOTOR BALL BEARINGS AND THEIR CARE

By F. H. Sweet



THE bearings of the motor car constitute one of the most important components, and for this reason if a motorist is to thoroughly know his machine he should give them attention.

The bearings with which the modern automobile is equipped may be divided into three different classes, plain, roller and ball, the names themselves describing the types with considerable accuracy.

The plain bearing consists of a cylinder which is open at both ends and split down the sides. Generally it is made of bronze and has a babbitt or soft metal lining, this being situated immediately against the rotating shaft. The babbitt and its supporting metal are securely locked together, and as a rule there are grooves, running cross-wise of the bearings or at an angle, cut in the babbitt to permit of even distribution of oil.

These bearings are used as supports for the crank-shaft of the engine and also for the lower ends of the connecting rods where they connect with the crankshaft. There is also another type of plain bearing consisting of a bronze cylinder, without the babbitt lining. These are usually known as bronze bushings. They are found at the top of the connecting rods, in the clutch, on the brake pedals, etc., or any other place where there is little danger of excessive heat being generated.

Knock Indicates Wear

When the babbitt plain bearing becomes worn the result is generally a knock within the engine. When this occurs it may be remedied by removing a shim, a very thin piece of metal located between the two halves of the bearing, or filing away part of the metal where the two halves touch. A laminated shim is made consisting of many thin steel layers, and by removing one or more of these the looseness or play may be taken up. This babbitt lined bearing requires perfect lubrication for, if the bearing is permitted to run dry, excessive heat is generated through friction and the soft metal is soon melted, or burned out, this being denoted by a pounding in the cylinder. The burnt out or worn bearing should be replaced or repaired at the earliest moment, otherwise a ruined engine may result.

The roller bearings are cylindrical in form and vary in length. Each consists of a series of steel rollers, which form the cylinder. They are divided into two main divisions, straight and tapered roller. There are also radial roller bearings and combinations of the two. These are generally used in the rear axle and rear wheels of the automobile. If one roller should become worn, an entire new bearing should be installed, for if all the rollers are not of the same size the accuracy of the complete part cannot be maintained.

Ball bearings consist of steel balls which revolve between two holders or races. These are the most flexible bearings known, and they consume very little of the power passing through them. Ball bearings are divided into several classes. There is the annular type, which has races in the form of rings; also the form which has an "L" shaped holder or race, with curved sides facing the balls. This is known as the cup and cone bearing, and they are adjustable, while the annular bearings are not. This cup and cone bearing is also classified according to the way in which it carries the load, as thrust or radial. Ball bearings are built which will withstand both radial and thrust load. Then again bearings of this character are made which have two rows of balls. To function properly these balls must not vary in size more than .001 of an inch. If one ball is worn through under-lubrication all the balls of the set should be replaced with new ones. While oil is used to lubricate the plain bearing, medium weight cup grease should be used for ball and roller bearing, and the best grade of grease is none too good.

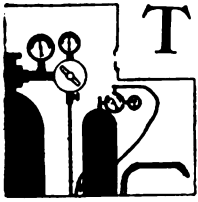
Every time the bearing is removed from the car it should be washed thoroughly in kerosene and dried on a

clean, dry rag. It should be kept free from water, dirt, grit or other foreign substances, any of which might be sufficient to ruin the entire bearing assembly. Before replacing the bearing, after it is washed, fill it with new, clean grease. Caution should be exercised in tightening

the bearing in the housing. See that the nuts are turned down evenly so as not to cramp the bearing in any way. The operator should never hurry in replacing the bearing, but should see that every step in the work is done correctly.

What Oils Should Be Used?

The Matter of Lubricating the Engine Is of Primary Importance to Every Owner



THE erroneous impression has existed for quite some time that after an engine has seen considerable service, the wear produced by such service on the metallic surfaces necessitates the use of oils heavier in body than were originally suitable. Further, that the progress of wear and need for heavier oils may be predicted for all cars on a definite mileage basis.

If we apply the acid test of scientific engineering analysis to this practice, we find that it is based entirely on the following:

Fallacious Assumption—No. 1

That wear takes place at substantially the same rate in all makes and types of engines under all conditions of service.

This assumption neglects entirely the fact that there are wide variations in the materials used for cylinders, pistons and piston rings in different makes of cars; differences in design and proportions; differences in manufacturing processes. It also assumes that all owners will accord their cars the same care.

It must be evident that variations in any of these factors will largely affect the rate with which wear will take place and consequently will make the mileage basis for determining the proper lubricant very inaccurate.

It is well known that the rate of wear of aluminum and cast iron pistons varies widely and that the care exercised in "seasoning" and finishing cylinders and pistons materially affects the life of these parts. Some owners will take no care whatever of their engines and may drive at high speeds. Others will give proper attention to lubrication and drive their cars with care.

For these reasons it must be plainly evident that any system attempting to determine the proper lubricant for all cars on a fixed mileage basis alone must yield results which are wholly inconsistent and not to be relied upon.

Fallacious Assumption—No. 2

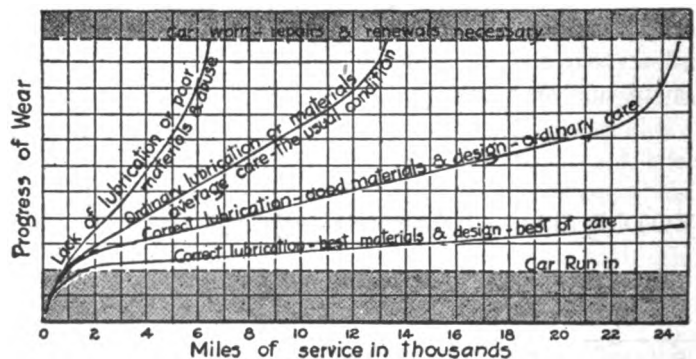
That from the time the engine is new wear is uniformly progressive in proportion to the mileage of the vehicle.

When engines are new, the metallic surfaces in contact with one another are only as smooth as is permitted by the method or methods employed in the finishing of such surfaces.

The ideal condition would be the lapping in, or finishing, of these surfaces to give them a high polish, completely eliminating all roughness left by the tools used by the manufacturer in production.

The methods usually employed in the quantity production of automobile engines do not permit of highly finished surfaces being secured. Likewise, the time required for producing such highly polished and finished surfaces would necessitate high cost in production and eventually mean higher cost to the purchaser of the car.

Examination by engineering experts of new cars of



How manufacturing and operating conditions affect the progress of engine wear

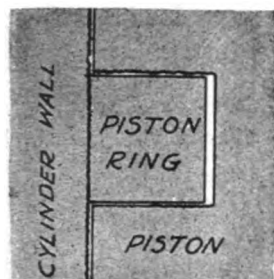
many different makes has conclusively proven that the engines, when turned out by the manufacturer, are run in only to a limited degree; consequently, when the car is received by the purchaser, the metallic surfaces are still somewhat rough.

Because of this it is necessary for the purchaser of the car to operate his engine at moderate speeds and loads for at least 1000 miles before the rubbing surfaces wear to produce running fits. During this period, however, it is not necessary to use a lighter oil than is correct for the car when run in.

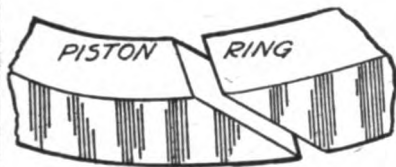
As the parts wear in, there is a slight but nevertheless marked increase in the clearances to the running fits required as indicated in Figure 1 by the first part of the

curves. The change in the condition of the surfaces is illustrated in Figures 2, 3 and 4.

Once these polished bearing surfaces and running clearances are produced as a result of engine use, very little wear will occur for many thousands of miles thereafter, if proper lubrication is provided. It must, therefore, be true that if wear takes place to any appreciable extent, such wear is directly due to poor lubricating value of the oil used or in rare instances, to poor design or materials.



Roughened condition of cylinder, piston and piston ring surfaces when engine is new



In use, the piston ring bearing surfaces wear to a perfect fit with the cylinder wall.

When wear has progressed to such an extent that the piston rings possess perceptible up and down movement, the pounding action of the rings on the sides of their grooves tends to increase the enlargement at a very rapid rate. This is the point at which trouble from oil pumping usually commences and the condition existing is represented in Figure 5. Under this condition the clearances have become so large that no oil, regardless of body or character, will prevent oil pumping or overcome blow-by.

To summarize the progress of wear we have, first, the running-in period during which wear is slight but rapid; next, the period in which the rate of wear is very gradual and dependent upon the degree to which the engine is correctly and efficiently lubricated; finally, the continued and accumulating wear causes pounding of the rings in their grooves and oil consumption rapidly increases. Excessive wear should be cut short and corrected mechanically by repairs or replacements of the worn parts.

Fallacious Assumption—No. 3

That piston clearances and piston ring fits alone determine the choice of the proper oil.

While it is absolutely necessary that the correct oil be one of ample body and proper character to seal the piston rings against gas leakage under all operating conditions, there are three other equally important factors which must be considered in selecting the correct oil for any automotive engine.

The first is the operating temperature. This is influenced by the type of service, the type of cooling system employed, the cylinder dimensions, valve arrangement and by the details of design.

Second is the ability of the lubricating system to handle oils of different bodies.

Oil to Use

It is well known that certain types of systems will lend themselves better to the distribution of light-bodied oils, while others work best with oils of medium or heavy body. It is also true that in some cases, due to details of the lubricating system, the employment of heavy-bodied oils may prove disastrous, due to lack of distribution of the oil under some operating conditions.

The third factor is carbon deposit. Due to characteristics of design, some engines will not burn cleanly oils of heavy body. The result is excessive carbon deposit which does not form when lighter oils are used. This condition is aggravated when heavier oils are used to overcome wear.

In other words, there are three very important factors which, in addition to piston, and piston ring clearances, affect the selection of the correct oil and which may render inadvisable the use of oils of heavy body.

Fallacious Assumption—No. 4

That the use of a heavy-bodied oil in engines that have worn excessively will overcome oil pumping.

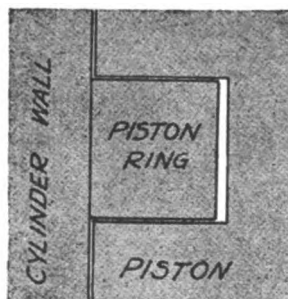
Oil pumping is the term usually applied when an engine is using large quantities of oil. In many cases it results in spark plug fouling and almost invariably in carbon deposits.

When oil pumping occurs in cars which have previously worked satisfactorily, heavier-bodied oils are often employed to reduce it.

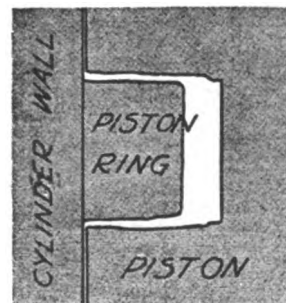
It is a fact that heavier-bodied oils are usually consumed more slowly than light bodied oils but this remains true regardless of the condition of wear. Hence, if a change is made to a heavier oil in a worn engine this oil will also be consumed in proportionately excessive amounts.

Consequently, when such oils work into the combustion chambers in excessive amounts they are not completely burned but remain to form large quantities of carbon.

Therefore, if the engine design were such that a heavy-bodied oil could not be used when the engine was in good condition, due to excessive carbon deposit, this oil would be still more unsatisfactory when wear permitted it to pass the pistons in excess.



In the fully run in engine, the friction surfaces are comparatively smooth.



Wear results in excessive piston ring slot clearances which no oil can seal.

Any other factors of design making unsuitable the use of a heavy oil in a new car would continue to exist regardless of wear and render its use inadvisable.

We find that the determination of suitable lubricants for automobile or motor truck engines on an arbitrary mileage basis is unsound because:

Rate of Wear Varies

1. *Rate of wear is not constant for all engines.* It varies with the design, material, manufacturing finish and the care given them in service. It is chiefly controlled by the value of the lubricants used.

2. *Wear is not measurable in terms of mileage operation.* The manufacturing finish is an initial variation especially in quantity production and all cars are subjected to a wide difference in care on the part of operators. The selection of the correct oil will minimize wear not affected by mechanical imperfection in design, manufacture and operation.

3. *Variation in piston clearance and piston ring fits are not the only determining factors in the choice of proper oils.* Operating temperatures, oil distribution, and the character of the oil as affecting carbon formation, are of equal importance.

4. *No oil, regardless of body, can seal excessively worn piston rings against oil pumping.* The recommendation of a heavier grade of oil after a short period of engine service is an admission that the oil originally recommended was incorrect.

Summary

The correct oil is the one which meets the conditions of operating temperatures and oil distribution; which provides a proper piston ring seal and in service leave a minimum of carbon deposit. By its use, wear is greatly minimized. Such an oil will be of a character to provide efficient lubrication, under all operating conditions, throughout the life of the car. When accumulated wear becomes excessive proper repairs alone will overcome its effects.

*Prepared by the
Engineering Division, Automotive Department of the
Vacuum Oil Company, 61 Broadway, New York, N. Y.*

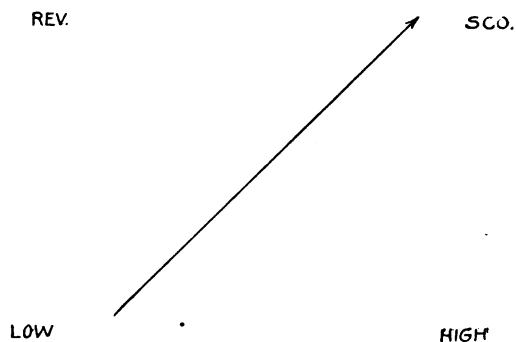
A SUCCESSFUL business man is one who can attend all these get-together noonday luncheons without letting his work go to pot.—*Dallas News*.

FAIR WARNING, ANYHOW

TEACHER: Johnny, your conduct is outrageous. I will have to consult your father.

JOHNNY: Better not, teacher—it will cost you two dollars. He's a doctor.
—*Buffalo Express*.

IT'S HARD to teach an old dog new tricks so when Gus Pfaff, in middle life, found it necessary to use an auto truck in his business and drive it himself, he decided he wouldn't trust to fickle memory in shifting gears. To that end he glued a six-inch square of paper on the gasoline tank in front of him and laid out on it this diagram, large enough and black enough to be seen at any time:



It is a good idea and one that many other drivers could follow with profit.

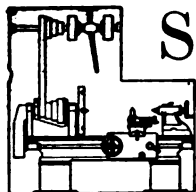
IF YOU never had any experience in hiring mechanics, read the following carefully. These men who have held such big jobs and worked at world famous plants are usually bluffers or confirmed floaters. They may have "worked in all the best shops in Europe" or have "been in the Buick plant six years" but that doesn't help out on a busy day if they don't know how to get the cam shaft out. We knew that Jim had been a year at the Locomobile plant in Bridgeport but we were surprised when he told that his job had been testing out new cars; later we learned that his work had been filling cases with oil and filling and applying grease cups—nothing else. Before the day of the auto game, floaters usually told that they had worked at the Baldwin Locomotive Works but when put to work on a job they quickly proved that they knew far less about the business than the spindle legged kid just hired who had learned his trade at some unknown little shop back in the woods—and the same is true of automotive floaters today.

SCENE:—A Broadway salesroom where a well-dressed couple are inspecting one of the latest French creations. Couple torn between desire to keep their money and longing to possess the beauty, to the envy of their friends. The former feeling rather predominates and the sleek haired salesman almost froths at the mouth in his endeavor to get the coveted signature. (Oh, yes, it's a car.) "This is one of the French aristocracy, you know." "What's that to me," replied the sterner one, "my grandfather was one of the original ten Ikes of New York."

Welding With the Hammer

With the Passing of the Blacksmith, the Repair Man Must Soon Learn to Hand-Weld

By J. F. Springer



SO many are busy about electric welding, oxy-acetylene welding, thermit welding, oxy-hydrogen welding, and the like, that we are apt to forget the advantages of the ordinary, old-time welding, done on an anvil with the aid of a hammer and the smith's judgment and muscle.

The present writer has been active in promoting oxy-acetylene welding and is well acquainted with its claims for recognition. He values it and values it highly. At the same time, there are many jobs which can be done to better advantage by the old method. Let me list some advantages of anvil welding:

- (1) Steel need not be so excessively heated.
- (2) The joint may be made without very serious loss of strength of the metal.
- (3) The apparatus required is simple.

These are splendid advantages and should never be lost sight of. At the same time, it isn't everybody who can get the best results. The reasons are partly lack of knowledge and partly an indisposition to learn. It is the purpose of the present article to emphasize prominent features of the best and most approved methods.

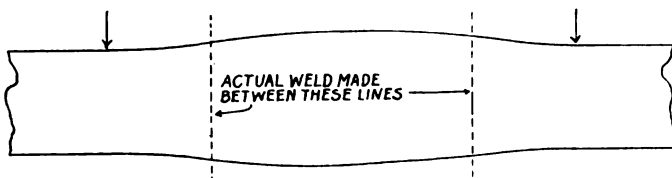
What Welding Really Is

There is one great fault with blacksmith welding which calls for serious attention. The hammer is used for two reasons. (1) It is used to force the two surfaces together and thus facilitate their union. Probably, workers are in general more or less awake to this. They know that the one piece of metal will not unite *of itself* with the other piece; and so they pound away. This is all right. If the one piece isn't pounded onto the other, nothing much will happen. (2) But hammering is, or should be, done for yet another purpose. The quality of the metal is more or less injured by heating it up to the 1900° or 2000° F. indicative of the welding temperature. It may be laid down as a general rule that any heat above 1274° injures the metal and produces weakness. The higher the heat above 1274°, the greater the injury. Now 1900° and 2000° are quite a distance above 1274°, so that the welding heat necessarily produces a good deal of injury. But it so happens,—and it is a fortunate thing,—that pounding the hot metal with the hammer operates in the direction of restoring the quality. So then, hammering performs two services—union of surfaces and restoration of quality.

Probably one-half of all welds made are deficient in this matter of restoration of quality. The quality may

be fairly well restored right at the joint. But this is not enough, since other nearby parts have been heated up to fairly high points. Just a little away from the weld on both sides is a region which has usually been highly heated, but which is apt to get slight attention from the hammer. These, then, will be weak spots. The metal has been injured in quality, and there has been no restoration of that quality. When put to the test, the break when it occurs will probably not be in the weld. But the repairman need hand himself no bouquets for this—or at least not yet. The break will probably occur one side or the other, at a little distance from the weld. Such a break indicates failure on the welder's part to deal properly with the metal *away from the joint*.

There are other faults in anvil welding. One concerns an imperfect union of the surfaces. Sometimes the union will not take place, even if the smith pounds the hammer off the handle. Nearly all of the industrial metals are affected, when hot, by the action of the oxygen in the surrounding atmosphere. That is, the heated surface suffers by oxidation. The frequent result is, in the case of iron and steel, the formation of *scale*. Then iron and steel surfaces get dirty. This may arise from contact with the fire. Scale and dirt, if they happen to be caught in between the surfaces that are to be welded, are nearly certain to prevent union at the spots where they happen to be. Pounding with the hammer is no adequate remedy. In short, clean metal should come against clean metal. The pounding will then produce its proper result.



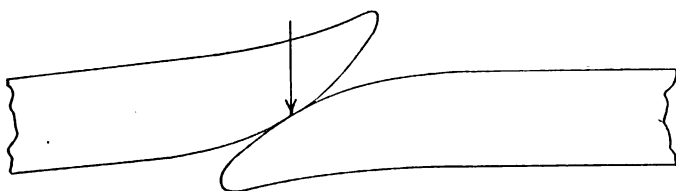
Arrows Show Where Breaks Are Apt To Occur When Welded Work Is Put Under Stress.

There are two methods used by welders for the purpose of getting rid of scale and dirt. (1) There is the *welding flux* and (2) there is the *form of the scarfs*. The flux is a chemical substance whose business it is to combine with unwanted things on the surfaces and carry them off. It operates a good deal after the manner of soap when applied to dirty hands. The scarfs may be so shaped that the hammering will cause them to operate in the direction of forcing bits of clinker, etc., out from between them. The unwanted clinker or the like is shoved out, as it were.

The foregoing analysis covers the requirements of good welding. Of course, I have only outlined the matter; and illustrative examples should be given, in order to make sure that the points are properly understood.

Heat Treatment Necessary

But while what has been said covers fairly well the requirements of *good* welding, they do not go the full length and take in those necessary for the *very best* welding. If welding is to be carried out in the very best manner possible, the work must ordinarily be given a proper *heat treatment* as a finishing operation. Unless the job is of exceptional form, it will be next to impossible for the welder so to manage the hammering as to deal fully and effectively with *all* the metal that has been heated to too high a point.



Proper Forms of Scarf. Arrow Shows Where Surface Should First Be Made To Unite, When Hammer Is Used.

About the only way to make sure that all points, inside and outside, at the joint and a distance away from it, are reached by a restorative action is to use a process which will seek out all the points. Heating the work up again may be counted upon to do this, and it is just about the only remedy that can be depended upon for the generality of cases. In short, nearly every job of anvil welding should be annealed for the purpose of restoring the quality that was impaired by the heating operations. Heat penetrates everywhere—hammer action does not. Here is the whole matter in a nutshell.

Let us now recapitulate. If the smith uses his hammer to the best advantage, and at the same time does not neglect to form the scarfs properly and to use a proper flux, he can expect good results. If he wants the best results, he must reheat the whole job—or at least the parts that were involved in heats above medium cherry red (1274°)—and give an annealing treatment. This is the way the best hand-welded chain is made for naval vessels.

Practical Anvil Welding

The general rule to be followed in forming *scarfs* is so to shape the surfaces that one convex surface will come next to another convex surface. That is, the two surfaces which are to come into actual contact are *rounded*, just as the surface of an egg is rounded. The object in view is to fix things so that when the one surface is *first* put on the other, there will be contact at only one point. If one egg is made to touch another, side to side, there will be only one small spot of actual contact. This illustrates exactly what is wanted when scarf touches scarf.

When the hammer now strikes, it is made to produce its

first effect at the small spot of contact. That is, the hammer is made to hit the metal exactly over the contact place. The first union occurs here.

The hammering now proceeds with the view of building up the size of the first spot of contact. When the scarfs are formed right, and the hammering is done right, the welded place is first a small spot. This becomes larger and larger as the hammering goes on. Pieces of clinker or other material are forced out. At any rate, this is the object in view in making the scarfs round and in doing the hammering in the way explained.

First Few Blows Important

It may be gathered from the foregoing that the hammering should be done with some precision. The first blow is an important one. The next blows should come close to it, and may often be placed in a ring around it, each blow now overlapping the central one. If these directions are neglected, then the weld may entangle bits of clinkers or the like. Thus, if a blow comes down on the metal and causes a union near a clinker, and then another comes down on the other side of the clinker, the result to be expected is that the clinker gets caught and becomes a part of the weld. Wherever it is, there will be absolutely no union at all. The metal at that point remains unwelded. The same holds true with bits of scale and the like. Subsequent hammering does no good. Metal can not come against metal, because something else is in between. You can't make the piece of scale or clinker become a part of the metal by hammering or heating, or anything else; unless you open up the weld and take the thing out.

Remedy for Scale

Most cases of welds spoiled by scale and clinker are probably often preventable by other means. If you don't want to be hung, the very best thing to do is *not to be there*. So with welding. The best remedy against clinker and scale is not to have any. Then, they can't get caught in the weld. Scale is formed by oxidation, the 20 per cent oxygen in the air doing the business. It is necessary to have oxygen enter the fire to make it burn; so there is bound to be danger that some of this oxygen will act on the steel.

Perhaps it is impossible to eliminate all danger, as the blast simply has to be operated to get the heat. But, the danger may be reduced very much by the use of judgment in operating the blast. The thing to do is to put just enough air into the fire—and *no more*. This is the opinion of J. L. Bacon, a practical man, as well as a writer on forging. To avoid clinker, it is well to know at the beginning that clinker is the stony and unburnable part of coal. Coal that has had all or nearly all this part removed will naturally have little or no clinker. If coke or charcoal is used, there ought to be but little trouble in making sure that no unburnable material is present. So then, the way to avoid clinker in the weld is to have a thorough clean fire.

Fluxes are substances used in welding, soldering and the like for the purpose of clearing off the surfaces and providing clean metal and nothing else. In welding steel and iron, there is apt to be oxide, in spite of the precautions already described. There are several oxides of iron. One of these forms at a low temperature and is known as rust. It is the black oxide of iron with which the blacksmith has trouble when welding. Some persons might think it would melt and flow away. The trouble is that it takes a pretty high heat to melt the black oxide. Wrought iron will stand this heat, so it is understood.

But it is not advisable to heat machinery steel and tool steel to such a temperature. A flux may be used at a lower temperature, and the black oxide gotten rid of by its assistance. The flux seems to form a kind of combination with the black oxide. This combination or mixture becomes fluid at a reduced temperature. When it flows away, the black oxide is disposed of. *Borax* and *sand* mingled together form a good flux for welding purposes. Let the borax be first of all well pounded up and afterwards mixed with the sand. When the welding job has reached a *yellow heat*, this mixture may be sprinkled over the surfaces that are to be welded together. The heating is kept up until the metal has reached just the proper heat desired.

Care should be taken, if possible, to prevent the flux running off too soon. It has, theoretically at least, two duties to perform. First, it forms a protective coating and prevents more oxide from forming as the heating goes on. Second, when the right temperature is reached, the scale underneath forms a combination or mixture with it. One authority says: "The metal when heated in contact with the flux becomes soft and 'weldable' at a lower temperature than when without it." I don't know whether this is a real fact or not; but I pass it along for whatever it may be worth.

There will be occasions when it will be impossible to keep the flux in place, while the heat is being pushed up from a yellow to the welding temperature. The smith may, accordingly, have to make additional applications of the flux.

The usual borax contains more or less water. It is best to use borax which has had the water removed. One may remove it himself in the following way. Heat the borax up in a suitable vessel. As this goes on, more or less bubbling takes place, water going off into the air, in the form of vapor. The heating is pushed on up until at last the borax is melted. This borax, when cooled off, is free from water and suitable for use as a flux.



Side Play in Connecting Rods

3084

From F. W. Beyer, Illinois: I would like to know if there is supposed to be any side play in a connecting rod bearing. In my engine there is from 1/16 to 1/8 inch side play in each connecting rod.

Reply: As a general rule a slight play, in connecting rods, from side to side is nothing to worry about. But one can never tell just what will happen in such cases. The writer has a Hudson car which developed a wrist pin (?) knock last year. The writer has had over 15 years' experience in the game and was practically sure that all symptoms pointed to a certain wrist pin. Every repair man who examined the engine said the same thing, for the writer simply wanted to get their opinions.

The knock was not a wrist pin knock, but end play in the connecting rod. Now, incredible as it may seem nearly 100 repair men passed on the diagnosis as correct, yet the engine does not knock now and the only repair the writer made was on the connecting rod big end bearing; i. e., it must have been end play in the rod.

But it is fairly easy to explain this in a Hudson car

because the crankshaft is very accurately balanced and is driven by helical gears. The period of vibration in the shaft is horizontal rather than verticle as it would probably be in a Ford engine, hence the tendency is to shuck the connecting rods back and forth.

We would advise you to leave the play in the Ford rods unless the engine commences to knock. A careful application of a light punch and hammer will rivet over the edges of the bearing so that the play will be eliminated.

Changing Ford Gear Ratio

3085

From W. R. G., Indiana: I am overhauling a Ford sedan and as I live in a rather hilly country I am thinking of changing the gear ratio from 3 7/11 to 1 to a ratio of 4.2 to 1. What will be the effect of such a change upon the speed and power of the car? What probable effect will it have or gasoline mileage? I have but recently driven the sedan, previously having had a touring car

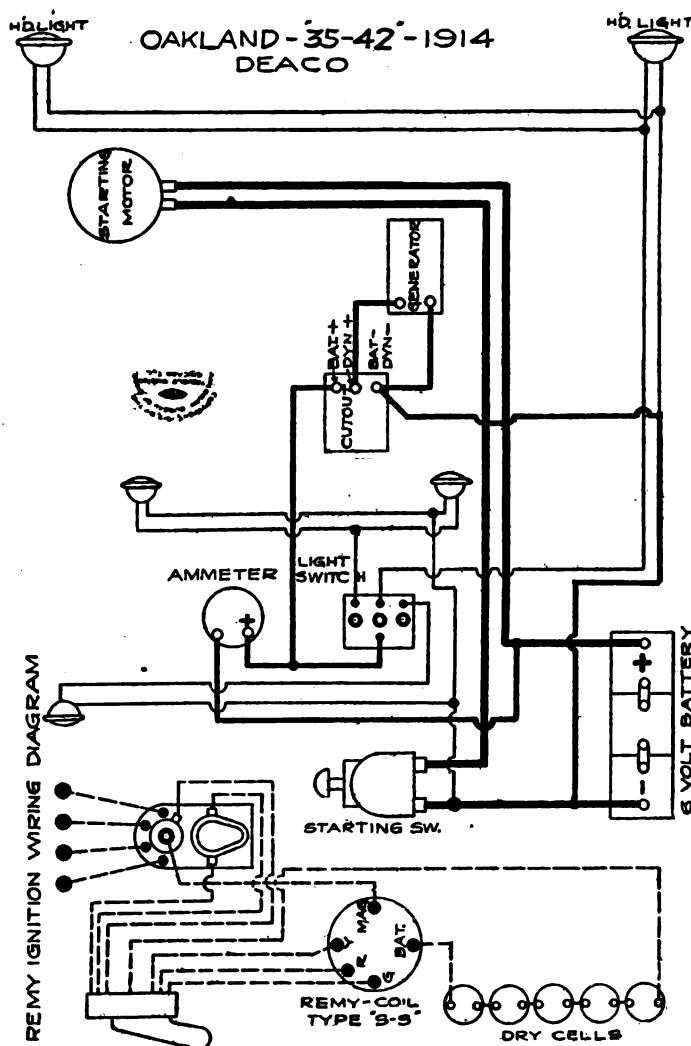
but it seems to me that the touring car had much more power than the sedan.

Reply: The change in gear ratio of from 3 7/11 to one to the ratio of 4.2 to one will make a difference of 15.5 per cent. in power and speed. That is to say you will add 15.5 per cent. to the power and decrease the speed 15.5 per cent.

It is impossible to figure the gasoline mileage as compared with your present rate. The difference will bear no stated relation to the gear ratio change.

Theoretically your mileage should be practically the same. There is a slightly greater loss from friction due to the slightly higher engine speed, but this is negligible.

You are entirely right about the difference in power between the touring car and sedan, the latter being much heavier than the former.



Oakland 1914 Wiring

3094

From Henry Ditchett, California: Will you kindly print the wiring diagram of the Oakland model 35, 1914 car? This car has a two unit starting and lighting system and a Remy magneto with kick switch and unit coil. Originally the ignition system had a set of dry cells. Is it necessary for me to use cells or can I use the regular storage battery?

Reply: The wiring diagram requested is printed on

this page. In all probability you can use the regular storage battery for ignition. Make the connections with the battery instead of the cells, but try an ammeter in circuit with these wires while switch is off to be sure that the connections do not short circuit the battery.

Tire Chain Noises

3095

From S. F. Coulston, Pennsylvania: Will you please tell me the cause of a grinding noise which my machine makes when chains are put on the rear wheels? My car is a six cylinder Reo and when it is being run with the tire chains on it sounds as though the gear case were running dry, but I know that is not the case.

Do you have any data on the relative number of power impulses to a revolution of the 4, 6, 8 and 12 cylinder engines?

Reply: Tire chains will always cause a grind, more or less noticeable because the links grind against each other and against the hard road. This grinding noise is transmitted very easily through the metal parts from the wheels to the gear-set or frame. The wheels act as a sort of sounding board. This is a normal grind which one must always expect when chains are used.

The use of chains has a disadvantage in that the chains tend to shuck the wheels backward and forwards in the axle. These side strains are absorbed in the differential. If the differential is not in good condition or has side play then considerable strain is put upon the master and pinion gears, hence a grind. Side play in the differential which might go un-noticed under normal conditions is noticeable when chains are used.

In any engine of the four cycle type all cylinders explode once for every two revolutions of the crank shaft. Thus there would be 12 explosions or power impulses for every two revolutions in a 12 cylinder engine which means 6 explosions per revolution. Then a four cylinder engine would have 2 power impulses per revolution; a 6 would have 3 per revolution and an 8 would have 4 impulses per revolution.

Installing a Pump Shaft Bearing

3096

From Eugene Holstaff, Maine: The pump shaft, which also drives the generator on my Buick, D.45 has too much end play. Some time ago I installed a bronze washer in the pump housing, but that wore off and the trouble has begun again. Is there any way to install a ball or roller bearing on this member?

When I wish to move the car in the garage and take hold of the rear wheels there is a slight give to the spokes before the car moves forward. Do you think the lost motion is in the axle or the hub?

Reply: There isn't really any practical way for you to apply a ball bearing to the pump shaft on this car. In

the first place we doubt if there is room for the bearing. An ordinary ball thrust bearing will be upwards of $\frac{3}{4}$ of an inch in thickness and even if you could install it, it would wear rapidly from lack of proper lubrication. The bronze collar is cheapest and best, though if you could install a bronze washer to slip between two steel washers it would be even better. Steel against red fibre is also a good and cheap combination. Try to fit a leather covering over the outfit and keep it packed with grease.

If we understand your question correctly; i. e., when you grasp the spokes of the wheel and push on them the wheel gives slightly before the tires catch on the floor and push forward; the trouble is probably in the demountable rims. Perhaps the wedges are not tight enough to hold the rims to the wheels. Buy some oversize wedges.

A loose key in the hub wouldn't be noticeable unless you had the gears and clutch engaged. Jack up one wheel, put in the reverse gear (ignition off) and you will find how much play there is between the wheels and the transmission.

Wiring of Packard 1914 Car

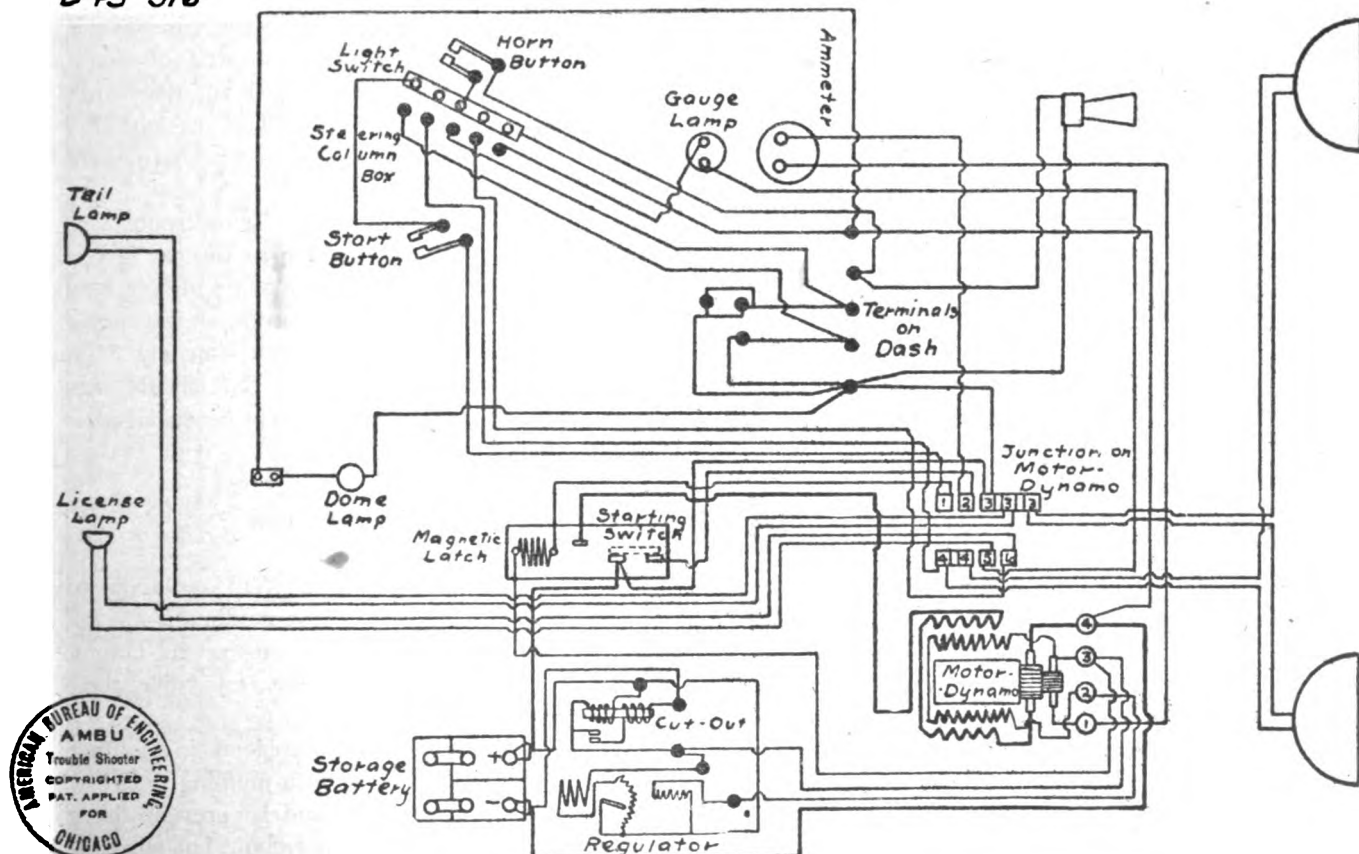
3094

From J. M. Barcus, Illinois: I have a 1914 Packard car, which has a Delco starting and lighting system, I think it is Model 138. I would like to have the wiring diagram of this car if you will please send it to me.

Reply: The wiring diagram is printed below.

DELCO PACKARD "138" 1914

B43-316



Piston Clearance

3094

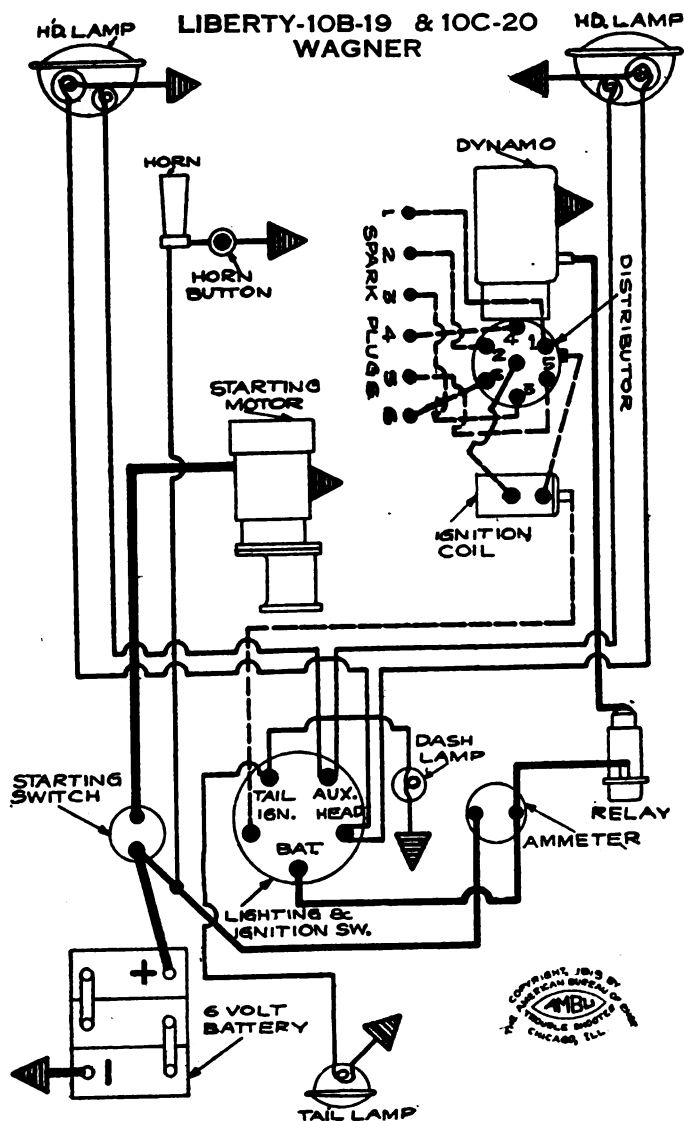
From W. H. Rumbaugh, Indiana: Will you please tell me the correct size of pistons to use in my Ford car? I intend to regrind the block just enough to straighten it up. Would you recommend a straight piston or one which is tapered toward the skirt? (Smaller at the top.) How much smaller should the piston be than the bore of the cylinder?

Reply: It is a general rule to allow .001 of an inch clearance between piston and cylinder for each inch of piston diameter. In the case of the Ford car the clearance would be .00375 or to be entirely safe it is better to make it .004 at the top and .003 at the bottom or skirt. The taper may be uniform.

Practically, however, it hardly pays to taper off the piston except where extreme accuracy is necessary. The compression depends entirely upon the rings anyway and if the rings are tight, then the piston clearance can be more without causing trouble. A clearance of say, .0055 would probably be great enough to cause piston slap if the rings were not wide and stiff.

When you buy the new pistons it will be advisable to give the manufacturers the correct bore and let them fit the rings into the ring grooves; then you can scrape the ring faces to fit the cylinders. Use Prussian blue on the cylinders and scrape the rings to fit. We would advise you to obtain the pistons from some piston manufacturer.

Don't grind out any more metal from the cylinders than is necessary to make them round.



Liberty 10-B Wiring Diagram

3091

From H. L. Barker, Rhode Island: If possible will you kindly send me the diagram for the Liberty Model 10B car? This machine is fitted with a Wagner, two unit starting and lighting system.

Reply: The wiring diagram requested is printed on this page.

Transmission System Knocks

3092

From Owen Reese, Oklahoma: Will you kindly answer the three following questions relative to a Columbia Six, special sport model, Continental Engine, Atwater-Kent Ignition, Borg & Beck Clutch.

1. With the gears in neutral, clutch out, there is a knock in the clutch which is regular, seemingly to occur with every revolution of the flywheel. When the engine is speeded up the knock speeds up, but disappears at high engine speeds. Knock cannot be heard when running with gears in high and car running at low speed. When clutch is depressed about two inches the knock stops.

2. After engine has warmed up and when running car in high gear at 30 miles an hour or over a miss fire develops which is very irregular. At times, when engine is running idle it will spit back from the carburetor. I have adjusted the carburetor perfectly, I think. When car is turned sharp to the left the engine tends to miss fire before picking up again but will not skip if car is turned to the right.

3. How fast is the above car geared to run?

Reply: 1. From your description we judge that the clutch knock is due to a loose member in the revolving assembly of that unit. With the clutch pedal depressed, practically all of the mechanism except the driven disc, (the one faced with fabric), revolves with the flywheel. Thus, if any member has the slightest play it may cause a knock.

But just as soon as any pressure is put upon the parts, they are all locked together and the knock stops. There will be pressure on these parts at all times except when the clutch is thrown way out. We cannot tell, without inspecting the car, just where the knock might be because there are so many members in this type of clutch.

2. The answer to number two may be "sticking valve" or "broken insulation on ignition wire" or both. We would suggest that you make a thorough examination of the wiring on the car and note especially the points where the wiring passes through metal parts. The writer recalls a similar trouble with a Franklin car which missed explosions every time the car was turned to the right. It required a very thorough examination, several in fact, before we found that a stranded cable had broken slightly and one of the strands had pierced the insulation and contacted against a frame member. Before we found the trouble we had to move practically every wire on the car and even when we had traced it to a strip of wire only two feet long, passing between the dash and the frame, we were puzzled. It was only by chance, as our fingers passed over the cable, that we felt the sharp point of the broken strand.

A sticking valve might cause the same trouble and be affected by the weaving and strain as the car is turned. Try the valve springs by putting a screw driver between the coils and twisting to put more strain on the springs.

3. Your car is geared to run approximately 35 miles an hour at normal engine speed. Car should not be driven over 45 m. p. h. or engine will be damaged.

Engine Mufflers

3093

From H. Fischer, New Jersey: Will you kindly advise me as to the best arrangement for muffling a 4½ H. P., Ideal, stationary engine? We are using an automobile muffler at present but wish to make, if possible, the most efficient muffler possible.

Reply: One of the biggest problems in muffling the exhaust of an engine is to obtain a muffling device which does not cause back pressure and so prevent the gases from escaping freely. We do not doubt but what the au-

tomobile muffler is as near perfect as can be designed and perhaps it will be cheaper for you to buy a muffler from one of the higher priced cars, than to experiment on a home made device.

However, if you wish to try the experiment, doubtless you can make a muffler which will not only quiet the exhaust but be fairly free from back pressure.

The automobile muffler consists of nothing more than a number of sheet steel tubes, one within the other, sealed at both ends by heavy castings, the gas enters at the center tube, traverses it and finds its way to the next outside tube through holes bored in the end of the first tube. By this means the gas travels back and forth through the various tubes until it escapes through the outside one. Some manufacturers reverse the conditions by entering the gas to the outside compartment and letting it exhaust from the center.

A type of muffler which you might try utilizes the principle of impacting sound waves and is very efficient. You are familiar with the method of amplifying sound by means of the horn as on the phonograph. The sound waves are magnified by entering them at the small end of the horn and gradually enlarging them. The reverse process might be used to advantage, in making a muffler.

Imagine a pack of ordinary funnels, such as are used for filling the gas tanks. If you were to start a series of sound waves into the large end of one of the funnels much of the sound would be absorbed or reflected and only a small part would find its way through the small end. Place a flat baffle plate at this end and then a second funnel. The sound would go around the baffle plate and enter the second funnel at its large end. The ar-

rangement might be continued indefinitely, first a funnel, then a baffle plate, then a second funnel; but always with the larger ends of the funnels toward the entrance.

If the whole assembly were placed in a sheet iron tube the sound waves would have to pass through each funnel. In this way the direct sound waves would be gradually absorbed and the reflected waves would be still again reflected in the direction of the original waves until all waves were absorbed.

By varying the size of the openings at the center and around the outside of the baffle plates the back pressure could be controlled. As an experiment you might make the center holes the size of the exhaust line and the diameter of the funnels about eight inches. The funnels should fit tightly into the casing and the baffle plates have a space of about $\frac{1}{4}$ of an inch all the way around them. Use fairly heavy iron for the two ends.

Wiring of Paige 6-55

3089

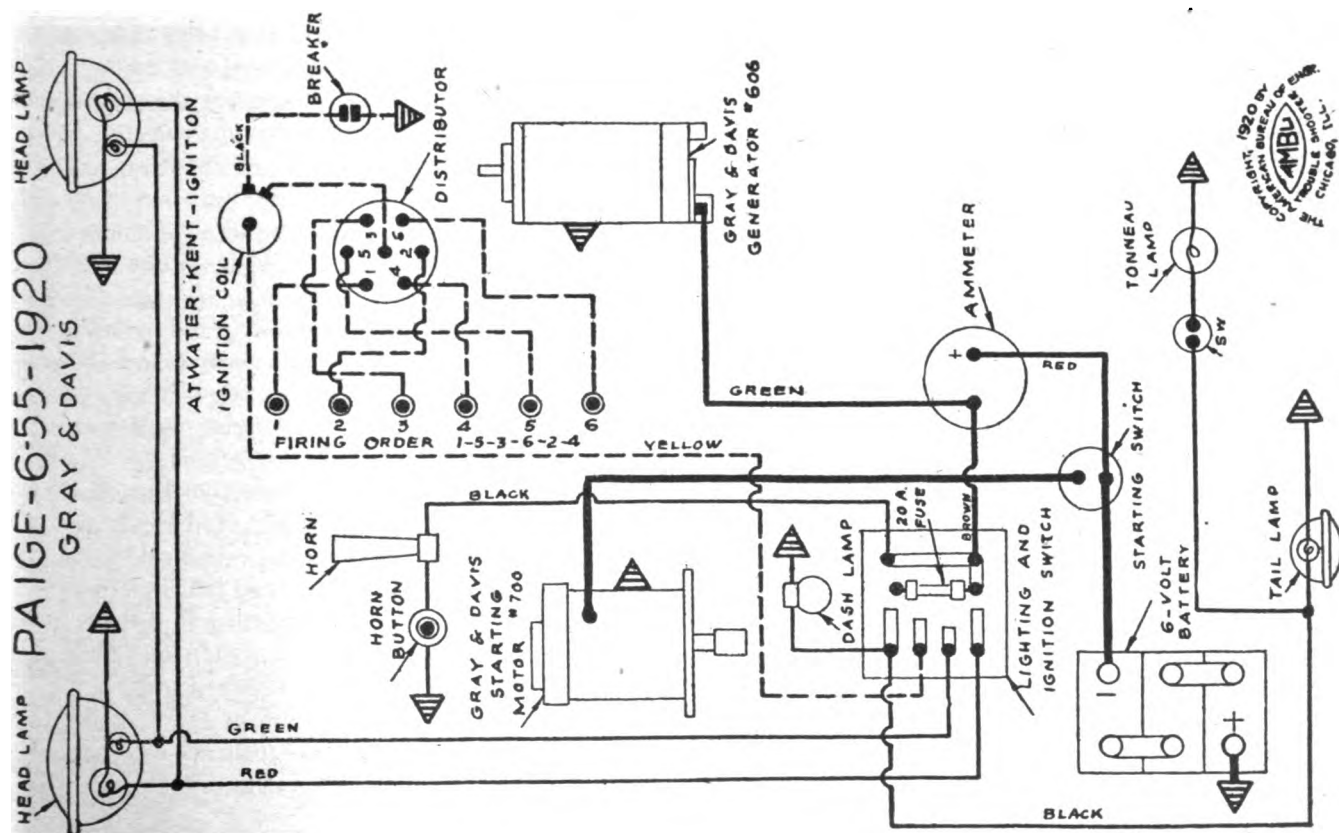
From J. Harry Calder, Texas: Will you please print the wiring of the Paige, Model 6-55, 1920 car? This is a Gray & Davis system.

Reply: The diagram of this system is printed on this page.

Maxwell Slips out of Gear

3090

From J. G. Cooper, New York: My 1916 Maxwell car slips out of high gear every time the car runs over a



NR 3247

bump. What is your opinion as to the trouble? The car has been driven 25,000 miles.

Do you think it would be advisable for me to spend \$42 to have the cylinders re-ground?

Reply: There are two possible reasons for the trouble which you mention. The car has been driven a fairly large distance and it is very probable that the clutch teeth on the high speed gear as well as the corresponding teeth on the main driving shaft are worn bevel. If this is the case it will be necessary for you to replace either the high speed gear or the main shaft, or both. An examination will show what is necessary.

The second possibility is wear of the shifter shaft or the pins which hold it in place. If you will remove the transmission cover you will find that the shifter forks are mounted on two steel shafts. Each of these shafts are fitted with concave cuts at the top into which fit a set of pins or balls which in turn are held in place by coil springs. If the concave cuts are badly worn the shafts will slip out of place.

Whether it is advisable to spend much money on engine repairs is purely a matter of general conditions. If the chassis, the transmission and the axles are in good condition we would advise you to have the cylinders re-ground. We assume that the price you mention covers the installation of new rings and possibly new pistons.

If the cylinders are re-ground properly, new rings fitted and the valves re-seated, your engine will be almost as good as new.

No Compression at times

3086

From B. E. Riker, New Jersey: I have a 1913 Ford car which is giving me some trouble. At times when I crank the machine the engine has practically no compression, but after it is started it runs satisfactorily. The piston rings and valves seem to be all right.

Reply: It is probable that the trouble is in the valve system because if it were due to leakage past the pistons or plugs you would always have the trouble.

Examine the valves the next time the engine lacks compression and see if the valve stems stick in the guides. Put a liberal supply of oil upon the valve stems and push rods. Also try the valve springs by putting a broad screw driver between the coils and giving it a half twist while the engine is running. If there is a difference in the engine action, an improvement, then it is evidence that new and stronger springs are necessary.

Semi-Dry Storage Batteries

3087

From E. Henning, Minnesota: I am interested in the semi-dry storage batteries of which we hear so much. I have been cautioned as to the reliability of such batteries, what is your opinion?

Reply: Your question is one which is being asked by many motorists who keep up with the advance of science

in this field. It is claimed by many engineers that a solid, or semi-liquid, which might be called a jelly, cannot be used successfully as a lead, storage-battery electrolyte; but we must remember that the airplane was scoffed at only a few years ago. It is wholly wrong to make a statement that a certain thing cannot be accomplished, because, then, someone immediately sets about doing it.

We have in our hands a report made by Mr. F. E. Edwards, chairman of the Technical Committee of the American Automobile Association, relative to tests made upon a semi-liquid electrolyte and we would advise you or any other readers, who may be interested in this subject, to write for this report. The paper may be obtained from the Chicago Chemical Co. of 20 East Jackson Blvd., Chicago, Ill.

The various tests reported as made embrace all of the elements entering into storage battery operation. They are comparative in that two batteries of the same size were used; one was filled with sulphuric acid electrolyte, the other with the semi-liquid electrolyte.

Various rates of discharge were tried, the batteries short-circuited, allowed to recuperate again and then short-circuited. The semi-liquid filled battery compared favorably with the sulphuric acid battery in every way.

Just as there are good, lead batteries and poor ones there will probably always be good, semi-liquid electrolyte batteries and poor ones; but the semi-liquid electrolyte is bound to make a place for itself sooner or later.

Oil Leakage in Ford

3088

From R. E. Grote, Ohio: I have a 1921 Ford roadster which is giving trouble in that it lacks compression. I recently installed a set of Superroyal rings, one to each piston, with two plain rings beneath but the compression is no better than before, despite the fact that the car has been operated 500 miles.

Do you advise me to wait until the rings wear into place? How long will this wearing in process take? Or would you advise me to grind the rings to fit the cylinders? What about pinning the rings?

Reply: Naturally the rings must fit the cylinders and the pistons or the compression will not improve and since this fit must be in two places, no one can say, without examining the engine, whether the rings will wear into place or not.

In the first place, the rings must contact against the cylinder walls all the way around. If the cylinders are oval, then you could hardly expect a round ring to fit. In such a case each ring should be fitted into its proper cylinder and pinned to the piston so that it will not turn. This, at best, is an unsatisfactory job. If the cylinders are oval they should be re-ground or re-bored.

But if the cylinders are perfectly round and the rings fit fairly well, then the chances are that they will soon wear into place against the walls. This brings us to the second point.

In the second place, the rings must fit into the piston

grooves. There is just as much chance for leakage behind the rings as in front of them, in fact more, because there is more wear upon the groove, tending to make leakage, than upon the face of the ring. Wear upon the ring face tends to make it fit better.

We would advise you first to see that the rings fit the grooves properly, then to fit them to the cylinders by filing. Coat the cylinders with Prussian blue, slip the ring up and down in the cylinders and the high spots will rub off the blue. Scrape the high spots with a very fine file or fine sand paper. (Do not use emery cloth.) Use great care not to remove too much metal.

We feel that the rings have been run long enough in your case to have worn in if they ever will. Don't pin them if the cylinders are perfectly round.

Snapping and Rattling

3097

From Chas. O. Hendricks, Massachusetts: I have a Chandler six, 1915 model, which uses a force feed system. I am constantly troubled with a snapping or rattling sound which appears to be in the gasoline tank at the rear. The noise is much like that made by sticking the end of a steam pipe under water and turning on the steam, only, of course, not so loud. The jarring of the car passing over ruts seems to start it, the noise being coincident with about every rut you go over. It is very disagreeable. Can any one shed any light on the cause and its remedy? Also can any one give a few points to be observed regarding a pressure feed system in general, as it is new to me, never having had it on any of my cars before. Pressure is obtained in this car from a small pump attached to one of the push rods and of course varies with the speed of the engine. The pump can be adjusted over a very wide range by means of a spring pressing on a ball check under an adjusting nut. The noise seems to bear some relation to the amount of gasoline in the tank, being louder the less there is in the tank and vice versa. I trust someone can shed some light on the subject.

Reply.—Looks very much as if some unsupported part sets up vibration. It may not be in the tank, but elsewhere about the car, although from what you say about the noise being more pronounced as the quantity of gasoline in the tank becomes less, it would seem that you have definitely located it. In this system an adjustable lift air pump furnishes pressure to force the gasoline to the carburetor, rather than feeding it by gravity alone. The noise may be due to lost motion at the pump transmitted through the air piping to the tank.

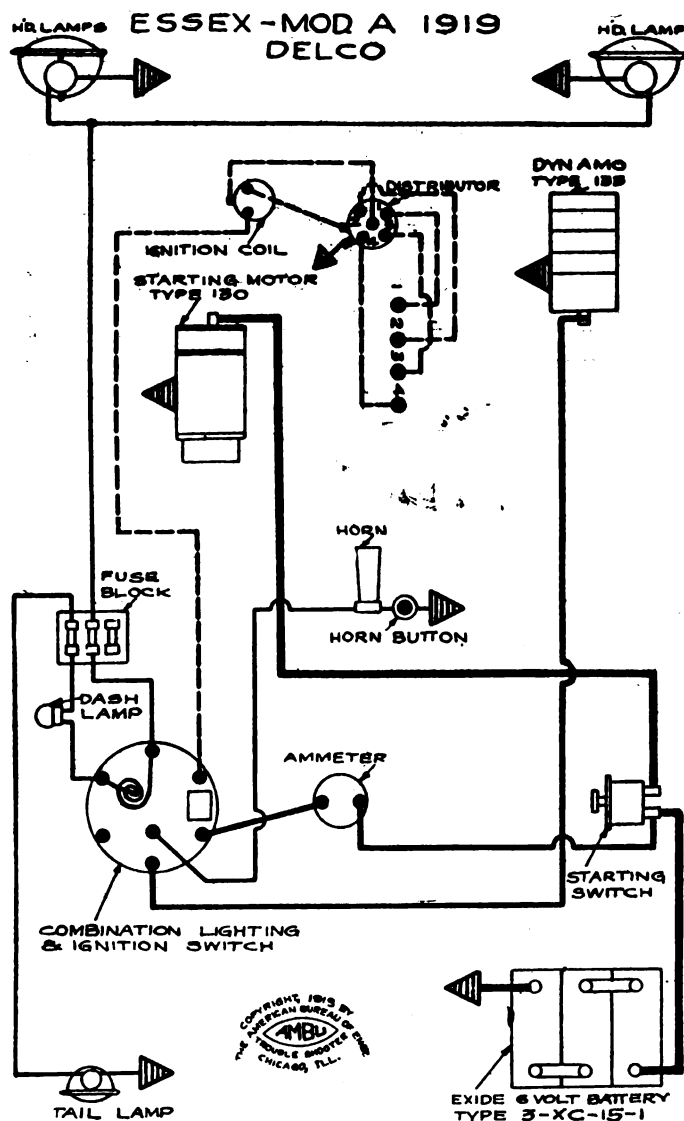
Timed Wrong

3098

From C. C. Atwood, Ohio.—Please state if the Ford timer can be put on wrong. I was in a garage here when a Ford came in, cracking and banging, and I claimed it was timed wrong. They took out the spark plug to No. 1 cylinder, turned the engine over until the plug sparked, then ran a long manicure file through the plug hole and

found the piston clear down. We turned the engine over until the head was up and both valves closed, then put the timer back on and saw that it sparked plug in No. 1 cylinder, and the engine ran O. K. I myself cannot see how the Ford timer can be put on wrong, but that is what was wrong with this car, and we could not find that the gears or roller arm had slipped any, nor was there a short circuit. The owner of the garage here, and myself, still claim against everybody here, that this Ford engine was timed wrong.

Reply: The easiest thing in the world to put a timer on in the incorrect position and still easier to mix the plug wires. What bothers us especially is how the engine came to run at all, although you say it "came in cracking and banging," when it is sometimes found hard to start motor cars when wired and timed in apple pie order.



Wiring of Essex Model A, 1919 Car

3099

From A. S. Twohey, New Mexico: I am overhauling my Essex car, 1919 model and would like to have a wiring diagram of this machine. Will you please furnish me with one?

Reply: A wiring diagram of the Essex Model A, 1919 car is printed on this page.

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MISSING NUMBERS—Our readers should remember that we are
always pleased to re-send numbers which have gone astray in the mails.

Solid Tires for Trailers?

THERE has been considerable agitation in New York state concerning a new bill before the legislature which would prohibit the use of solid rubber tires on trailer cars after a certain date next year. And although we are strongly in favor of good roads and just as strongly against anything working to break up the roads, we do feel that our law makers should be fully informed as to actual facts before they pass such a drastic law.

It has never been shown conclusively that solid rubber tires tended to break up a good road-bed. Under certain conditions the solid rubber tire might pack the road-bed down and the result would be for the better.

It is not difficult to see what might happen when we consider extremes. Suppose, then, we consider a vehicle equipped with extremely hard wheels, steel, for instance. We immediately picture the steam roller and we realize that if such a machine were driven over a road, the latter would be packed down solidly. But solid rubber tires are not so hard as steel and will not pack the road-bed down as well as a steam roller. Now let us consider the opposite extreme, the vehicle with soft wheels.

The pneumatic tire on an automobile is a good example of soft wheels. Now the pneumatic tire has a packing effect upon the road, but it has more of a suction, consequently it tends to take the top off the road and redistribute it or throw it into the air. The suction depends upon the speed. Hence the soft, pneumatic tire, driven at high speed tends to destroy a road quicker than the steam roller.

But the hard rubber tire is between these two extremes, it is too hard to have much of a suction effect, it is too soft to do much packing and the two things balance each other.

We can see, and are willing to concede that a trailer car, equipped with solid rubber tires, and carried at high speed might, possibly cause some damage to a macadam or dirt road, but we cannot see how such a vehicle would average to cause so much damage that it should be barred from the public highways.

Our law-makers might well consider the limitation of speeds and the gross weights of such vehicles as a temporary measure and forget the tire proposition for a while. There are many other pressing problems of greater importance which might well occupy their attention and if they spend too much time on tires, the motor trucks will be so long and wide that our roads won't be big enough for them.

Income Taxes

MANY of our blessings often come too late to be of any service and it is true that the only time our kind friends think to bring us flowers, is when we are too sick to enjoy them or perhaps when our earthly cares bother us no more. And so, in the same way, perhaps many of our readers will not take kindly to a few words regarding deductions from the income tax, mostly because by the time they read this article they will have filed the paper and deductions are a thing of the past. Nevertheless there are other years coming and you may assume that this editorial is a year ahead of its time.

Most of us are fairly familiar with the ordinary deductions allowable. But there are other deductions about which we seldom think and few of us even know, unfortunately. We have in hand a bulletin which has just been issued by the National Automobile Dealers' Association and which was prepared by Walter B. Guy, their Washington, D. C. taxation counsel. It is from this bulletin that we quote.

"All automobile owners may deduct from their gross income the amount they have paid for license fees." We assume from this that the car registration fee, which is really a state tax, is the one referred to and not the operator's license.

"The cost of gasoline, ordinary repairs and general upkeep, including garage rent and chauffeur's salary are deductible if the car is used for business purposes. A physician, lawyer or other professional man is entitled to similar deductions if the car is used primarily for professional purposes. In the same way, if the car is used partly for business, partly for pleasure, a pro-rata deduction is permissible."

"The owner may make either a full deduction, or partial deduction for depreciation on his car, depending upon the amount it is used for business." There is no specified depreciation, but we feel that it is fairly safe to charge off 20% each year on the assumption that the car life is

five years. In such event, of course, not more than the total cost of the car can be charged off.

"The Internal Revenue department has ruled that fines, paid by the operator or owner, for operating the automobile in violation of the motor traffic laws, are not deductible."

Why This Issue is Late

OUR readers will notice that our business office has been moved from the old address at 71 Murray Street to a new one at 16-22 Hudson Street, New York City. After such a statement it seems hardly necessary to insult the intelligence of our readers and give the reason for the lateness of this issue.

Not only does it take a certain amount of time to move an office, but when its roots are deeply imbedded, with a fifteen years' growth, the transplanting operation usually causes a set-back. But the next issue will be out on

time, as usual, and we don't expect to move our offices again for another fifteen years.

Fire Destroys Shaler Plant

ON Thursday, March 2nd, the entire plant, warehouses and offices of C. A. Shaler Company, Manufacturers of the Shaler Vulcanizers and Roadlighters, were destroyed by fire. All contents including stock, material and machinery were a total loss and only the office records, and furniture and a few of the most valuable patterns were saved. Three girl employees lost their lives, but miraculously there were no other serious injuries.

The morning following the fire the company was functioning in temporary offices. Manufacturing is being resumed in temporary quarters and deliveries are expected to be made within thirty days. Architects are already at work on plans for a new factory of sawtooth steel construction, work on which will be commenced immediately.

Resurrecting the Automobile

The Methods Used by an Amateur To Do Difficult Jobs with Inadequate Tools

By James F. Hobart.



SMITH had gotten his 1914 Cadillac, into pretty good running condition as described in previous papers and had driven on several long journeys, when he commenced to have trouble in starting. The engine seemed to develop but very little power and would stall two or three times when getting under way, but would run alright after once really starting. It seemed to have little power when slowed down and picked up slowly and badly.

When getting home from a sixty mile trip, a queer noise developed, seeming to sound once with each revolution of the engine. Smith determined to take the engine down. He rigged a chain hoist just inside of the door of his garage, he put a piece of 2 x 8 inch plank vertically in each side wall and two—2 x 8 inch joists across overhead, as shown in Fig. 1. There was a bench on one side, so Smith cut off a small piece of plank, fitted same under the bench, then placed the other piece of plank upon the bench directly upon the short piece. Smith intended first to put the hoist-beam on the top of the plates but found it easier as shown by the picture.

He backed the car into the garage and found five feet spare length of building, he borrowed a different chain hoist of one-half ton capacity, and made it answer but it was far too light, for the engine unit complete, weighed probably more than a ton.

Smith found that the engine could not be lifted out of the car but had to be dropped down to the floor. The

two suspension pieces could not be removed without taking down fenders and all the outer sheet metal portions of the car. He found the engine suspended from three points, from two vertical bolts in the rear and a horizontal pin forward. Smith had a terrible time removing that pin which was driven in towards the first cylinder and was fitted with a grease cup which Smith never had seen before he took the engine down. He had to remove the first cylinder to get that pin out and only did the trick by bending a two foot piece of $\frac{3}{4}$ " pipe to reach past the piston rod. Then he drove the pipe with an old axe, and bent the pipe more and more as the pin drifted out. He bent the pipe as necessary with

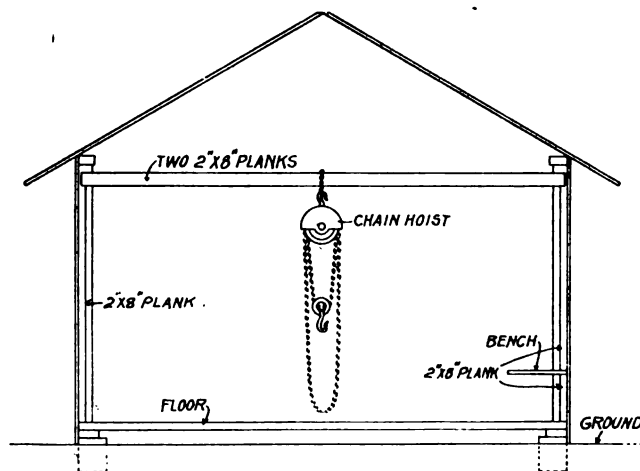


Fig. 1. Smith's Garage Hoist.

the axe, placing the pipe for that operation over a bit of plank laid on a timber and striking lusty blows on the pipe between the timber and the plank.

There was not room enough under the car to pull the engine out after it was lowered to the floor so Smith sawed four twelve inch sections from a firewood log fifteen inches thick. He put a screw-jack under the middle of the front axle and raised the end of car until two sections of log could be placed under each forward wheel.

As the jacking proceeded, Smith followed up the wheels closely blocking under the tires while raising the car. He was afraid of a sway sideways and both the rear wheels were blocked, both rear and front. He nearly got into trouble in this arrangement when the front end of the car went slowly upward and the rear wheels with their brakes set began to ride the blocking, but he was watching and caught the matter in time.

Taking Out the Engine

The engine was dropped easily with the front end of the car raised two feet, but the chain tackle was sadly overloaded and the chain stretched so that he could not hoist the engine an inch. It was too heavy for the hoist and Smith was afraid of its breaking and kept blocking under the engine all the time so that if the chain tackle did break the engine would drop only an inch or two and do no damage.

When the engine was replaced it was stripped of enough parts so that the hoist could lift it, but the stretched chain bothered badly in the replacing of the engine, and Smith found it necessary to pull the chain forward a few links until it caught in the upper sheave, then, slacken up so that the chain fell into the sheave pockets again; when another pull could be given. The hoisting and slacking had to be continued all through the operation of raising the engine.

Smith placed a stout plank under each front wheel, the rear end of the plank was pushed back as far as it would go, until it touched the fender, in fact, and then a cob-house blocking was built under the forward end of the planks as shown by Fig. 3. The log sections were moved to the rear end of the plank as shown. This arrangement was made in order that after the en-

and moved the planks, thereby making it easier for him to get under the car for doing the necessary work there.

A Makeshift

But while the engine was being dismantled, the planks were left in place and a few boards placed crossways on them to serve as a makeshift bench on which he placed the engine parts as they were removed. This temporary bench was found very convenient in the cleaning of the very dirty parts which was accomplished with the aid of plenty of kerosene, a four inch brush and a scrub-brush requisitioned from the house kitchen.

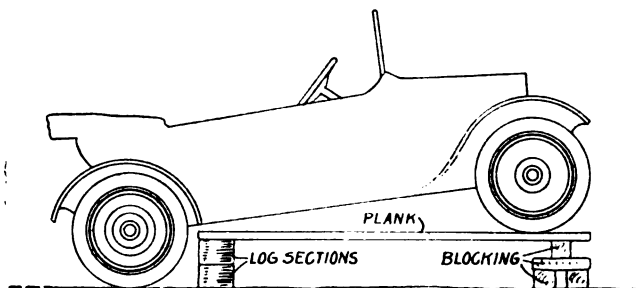


Fig. 3. Smith's Above-Ground Pit.

As stated, as soon as the engine was re-assembled and the parts removed from the temporary bench, the blocks and planks under the front wheels of the car were removed then the forward wheels of the car rested on the log sections, but Mr. Smith took the extra precaution of driving a three-cornered wedge on both forward and back sides of each front wheel.

Replacing the Engine

When the engine was replaced, it was with the car in its tilted position. The generator, water pump, clutch and cylinders having been removed from the engine, the too-light chain hoist was used to pull the engine back into place with the aid of the jack which was placed under the front end of the engine and served admirably to keep the engine tilted to the exact angle required to make the vertical bolts enter and to make the pin hole come right.

Every now and then Mr. Smith found another size of bolt or nut and had to buy another wrench to fit it. He never did use a too-large solid wrench, for that's what damages the corners of nuts and bolt heads. Smith has a fine collection of wrenches; now he can find anything required to fit any size of nut or bolt, and being particular to use the right size of wrench, the corners of the nuts are as sharp and true as when they were brand new.

Inside of the Engine

Smith got the engine to pieces and marked everything. He was careful to mark each piston, each cylinder and each rod. As he did not have a center punch, the marking was done with the corners of a very sharp cold chisel. After Smith had gotten the pistons nicely marked, he

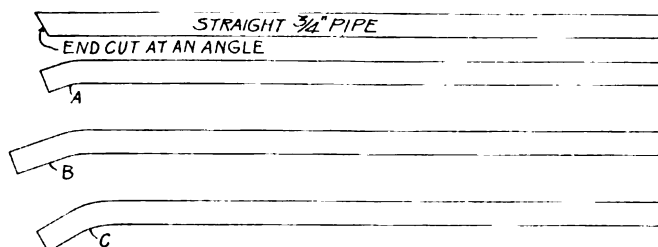


Fig. 2. Pipe Pin Drifts.

gine had been dropped on the floor, the tilted car could be run back upon block and planks until the rear end of the car top almost touched the end of the garage. When in that position the front wheels were directly above the log sections, then Smith jacked up the front end again

felt tired when he found that each connecting rod was numbered just inside of its hinged crank-shaft bearing. Smith tied the nuts and bolts to the pieces they belonged with and therefore had no "huntfests" when putting the engine together again.

Very little carbon was found in the cylinder, but much in the crank-case, which had gone down past the pistons to the sorrow of rings and to the wear of the cylinders which, however, was not bad enough to require reboring.

Getting New Rings

Smith ordered a new set of over-size rings through a neighboring garage. He waited ten days, then he countermanded the order and sent to a mail order house from which he got the rings in a week, but there were three kinds and eight sizes among the set of twelve rings. He only had to file the ends of two rings. Some of the rings were notched others bevel-cut, some taper and others parallel thickness. Smith, "said the verse" and in putting the new rings in place, he broke one while putting on a cylinder, therefore had to use one of the best of the old rings in its place.

He found very little adjustment necessary to the five bearings of the crank shaft. The first had a thickness of paper on thin liners. The others had iron liners sixteen and eighteen thousandths of an inch thick. Smith found that the first and second bearings required no taking up. The third bearing liners were filed $\frac{1}{2}$ thousandths of an inch and the fourth $1\frac{1}{2}$ thousandths of an inch and the fifth all of two thousandths of an inch. Smith wished for a stock of liners of various thickness at hand, but he didn't have them, so he had to file down the liners to the thinness required.

Fitting the Liners

Mr. Smith was able to approximately measure the amount to file from each liner by the difference in thickness of two of them, one of which was sixteen and the other eighteen thousandths in thickness. He found that when the thin liners were placed in the fifth or rear bearing that they were of just the thickness required there. This showed that two thousandths of an inch had to be removed from the rear bearing liners. Mr. Smith could not make up this bearing with the sixteen thousandths liners for the reason that the liners in question had a single bolt-hole, whereas the rearmost bearing carried two bolts and consequently its liners were different in shape.

By comparing the difference in thickness between the sixteen and eighteen thousandths inch liners, Smith was able to tell approximately the amount which must be filed from each set of two liners.

The cutting down of the liners was done by hand as shown by Fig. 4, with a ten inch mill file. A corner was first removed to a certain depth all around the liner which was fastened to a flat board by three or four small nails. The upper surface of the liner was carefully filed until the flat bevel had all been removed. The lower edge of the bevel served as a guide line to which the filing must be

carried and by being careful when forming this bevel, the guide line was made with considerable accuracy and in this manner Mr. Smith was able to remove the $\frac{1}{2}$ to 2 thousandths of an inch from the several liners.

Filing Liners

After filing a liner in one direction, as crosswise, then some filing should be done lengthwise so as to cross the

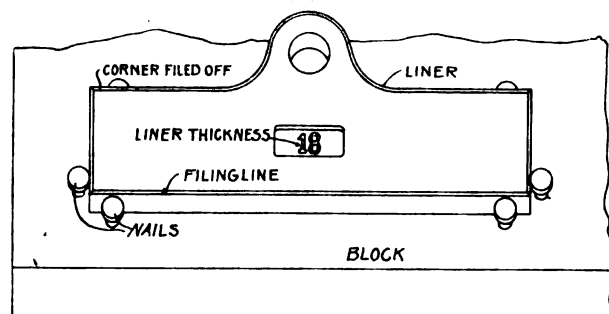


Fig. 4. Filing Liners.

file strokes. Then by watching the file marks, Mr. Smith found it possible to file each liner evenly and accurately to the required thickness.

Cleaned Out the Ring Grooves

The piston pins were found in good condition and nothing had to be done to them. The old rings were removed by means of four narrow strips of tin and a fine collection of dry grease and carbon was found in the grooved space underneath each ring. A good deal of time was spent in cleaning the ring grooves thoroughly, an old table knife being used for the purpose. Each particle of the deposits in each ring was scraped loose and washed out with kerosene. No gasoline was used in cleaning the parts of this engine but kerosene oil, and plenty of it, was used for this purpose.

A big bread pan about 12 x 20 inches, was used for a cleaning vat, and as soon as one lot of kerosene oil became grease-thickened, it was placed aside in a can to settle, after which, the clear portion of the oil was carefully poured off and used again for cleaning other parts of the mechanism.

Kerosene oil will remove grease nearly as well as gasoline and is not nearly as dangerous, or hard on the flesh of the hands. Gasoline applied freely upon the hands to remove grease, will draw the oil in the skin and cause chaffing. Kerosene will clean dirty parts as well and is not harmful to the skin.

Making up the Main Bearing

Mr. Smith tinkered quite a while before he found out how to best make up the five main bearings. He started with the first bearing, the one nearest the radiator, and adjusted the rings so that he could barely turn the shaft after the bearing was adjusted and bolted together hard and fast. Luckily nothing had to be done to the journal

bearings or the caps. That soft metal lining in each, was in perfect condition. But Mr. Smith found himself in trouble when he came to make up the second bearing, he could not tell how delicately it was adjusted because the first bearing held the shaft so snugly in place that he could not well judge the exact tightness or looseness of the second bearing.

Before Mr. Smith went any further, he figured out the fact that he must need adjust each bearing separately and before starting another bearing he must loosen the one already adjusted. This he did, slacking the nuts of each bearing after it had been made to fit the shaft snugly when the nuts were screwed tightly home.

With the nuts of the adjusted bearings again loosened, Mr. Smith was able to adjust each bearing and after he had gone over them all in the manner described, then he tightened the bolts of all the bearings, and found that he still could turn the crank shaft over, although it required considerable muscle to do so.

The Oil Grooves

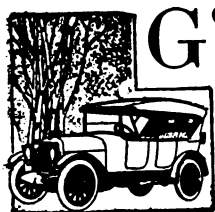
After Mr. Smith had cleaned every box and cap thoroughly, and had gotten ready to make up the bearings again, he discovered that he had quite a bit of unexpected work to do. He found that the oil grooves in most of the bearings contained considerable foreign matter. Upon investigation he found the matter consisted of oil, dirt, carbon and flakes of metal, the latter having been torn from the soft metal lining by the tremendous pressure against the engine shaft by the engine explosions.

Mr. Smith found it necessary to trim each and every oil groove in both caps and boxes, and it took him more than three hours to get the metal and dirt out of the oil grooves. When this work was accomplished, he carefully scraped and rounded the edge of each groove, making sure that no fragment of metal or any other matter was left there to get caught between the shaft and the journal bearings to make trouble when the caps were tightened down for good.

The Second-Hand Automobile

The Buying of a Used Car Is a Problem
Much Similar to that of Buying a Horse

By J. H. Moore



GOOD weather is approaching—in fact is upon us, and with it comes that indescribable feeling—that longing to get your hand on a steering wheel that guides a car—*your* car—down the avenue.

Of course you hope the neighbors are out on their porches, (that's *why*, or at least partly why you bought the car), but wait—perhaps owing to the high cost of meals, car storage and rent, you have sold your car, or more unfortunate still, perhaps you have never got further than the longing stage.

In any case, let's see why we started this story.

If you're a money-laden bootlegger don't read further, for you will be buying a *new* car, and no doubt have the model already picked out. However, if you belong to the honest-to-goodness motor bug fraternity, in fact if you are one of the thousands who must have some sort of a car, second-hand perhaps; well, read on.

Personally I belong to the latter mentioned gang, and what is contained herein is purchased by experience. When I buy a car it is a second hand one. I usually use it for a season or two, then sell it while it is alive. I then proceed to get another of more modern vintage, and carry on in similar manner.

The depreciation in such a case is not so great, and I can afford it, whereas the other way I'd have to dodge my tailor again and I haven't done that for years. However, let us not digress from the main theme.

When I first started to purchase second hand cars I made an awful mess of it, and my wife threatened to have my head examined. The worst of it was I hadn't an argument in the world, for my first few purchases had all the earmarks of insanity. Experience, however, is one grand old teacher. My chief trouble (as I can see it now) was my faith in human nature. If a man told me his car could do so and so, I smiled pleasantly and agreed with him.

I remember on one occasion, (even after a few seasons of experience) a *dear* friend of mine, who was leaving for England, offered me his car at a terrible sacrifice. The price looked so good, that I decided to sell the car I had, and purchase his. First of all I had to sell mine, for my financial condition did not allow two gasoline eaters at one time. I had no trouble in selling my old bus, as it was in very good shape (at the time), and making my way to my friend's home, announced my decision to buy.

The Test Run

Now luckily, where I lived there are quite a number of steep hills, that is from the level of the main portion of the city up to the hill district, so, sitting back in the seat I said grandly.

"Take me up to the hill district, Bill." Away we went, but in a direction quite unexpected.

After a while I remarked "Bill where are we going?" "Up to the hill district just as you asked"? came the reply.

"I know" I answered—"but I want to go up Avenue hill to test out the hill climbing qualities of the car."

This is the point where I fell. "I was rather afraid you'd ask that," said my friend, "and you know I'm always so nervous when I'm climbing a steep hill. All the time I've had this car I take the road we're running over now. The grades are easy, and I don't feel flustered. Of course the car *can* go up the hill easily. In fact the salesman who sold it to me would persist on taking it up the very hill you want to climb on high, and he did so easily, but I was a total wreck and my nerves were all shot when we reached the top."

I Bought the Car

"Gee, I didn't know you were troubled that way," I said sort of ashamed like—but why go further. I bought the car without even the usual probing around as I didn't want to hurt my friend's (?) feelings any further. I felt sure he would put nothing over me, and up to date of writing I feel sure that car has never gone up that particular hill on high, except if it had been towed up with the gears in high position. What's that? Did I sell it over again? You can bet I did. If I hadn't I'd be in the poor home now. Was I as bad as the other fellow?—Well now that's a different story. With this little true introduction, let us seriously tackle the points one should watch if purchasing a second hand car.

Trust Nobody!

First and foremost, *trust nobody*, even yourself when you are buying a second-hand car. Keep a stiff hold on your good judgment. Don't let your enthusiasm run away with your good sense, and last but not least, spend no more than you can reasonably afford. These few hints are mere preliminaries, however.

In picking out a second hand car do not place too much stock on the date of the car. I do not mean by this that a car built in 1915 is as good as one built in 1920, but I do mean that it might have been built in 1915 yet be in as good condition as one built only a season ago. Age is not the chief point to watch for, nor is the number of miles which the car has been run as important as you might imagine.

Speedometers are funny things. Sometimes they get out of order. Sometimes they can be disconnected, and often a second hand one can be purchased and installed previous to selling. What's that? Am I accusing anyone of doing so?—well—remember I said to trust *nobody*.

The big point is "How has the car been used?" A car might be four years old and only run a few hundred miles in that time, yet of very little use. The owner may have left it outside in all sorts of weather; he may have been careless of lubrication; grease and he may have been total strangers; and as far as tightening bearings, removing carbon, etc., etc., perhaps such things were out of his line entirely.

Mileage May Help Matters

On the other hand, suppose the car was owned by a mechanic, a man who not only understood, but took pride

10,000 miles, yet if the owner has taken proper care of it, you can safely depend on such a purchase.

Above all demand a road test, and see that it's a good one. After that, if the car still impresses you, make a thorough examination. Don't get flustered if he tells you others are waiting to see it. He wouldn't spend *his* money hastily, so why should you? At this point let me tell a little true story, that nearly everyone will find it hard to believe in this so-called "enlightened" age.

A certain gentleman, a friend of mine, had decided to purchase a car. However, when he called for me to go with him to see it, I was out, so he went alone. The following day he called to see me, and extolled its virtues. Luckily he had refused to close the deal until I had seen the car, but here is the story as he told it to me.

After he had elaborated on a number of points, (which I could plainly see were repeats of the owner's story and not his own ideas), he said, "And the fellow who owns it says his engine runs so nice and cool, that he was forced to take the fan belt off—even in the hottest weather."

After I recovered I said "Let's go down and look her over." On investigation I found that externally it was a fine looking car, but the working parts—oh boy! It's best not to talk about them. Yet, here was my friend, a wise man in all but automobiles, ready to bite easily as any gold brick purchaser ever bit. The moral is self-evident. If you don't understand cars—admit it, then take someone with you who does. Be certain that he does, then rely on his judgment.

Signs of Wear

An automobile is an intricate piece of machinery at any time, and one is apt to be misled by exterior appearances. The car body, the fenders, the top, and even the upholstery are points to watch. As a general rule the owner who is careless of these things, seldom bothers about his engine. However, do not let these signs influence you altogether for many a newly painted body has covered a multitude of worn parts. It's a simple problem, this picking out a second hand car, isn't it?

But how can one judge under these seemingly contradictory suggestions? First examine the various parts, or units, *carefully*. Next, have the owner give you a thorough demonstration road test, and last, but not least, ask him to put it through an efficiency test.

Watch the compression. After being *SURE* the switch is off, test the engine's compression with the hand crank. Insert the ratchet at the lowest possible position and pull up the crank slowly. If any of the cylinders are scored, or if the compression escapes past the valves or plugs, the one testing the engine will find very little resistance in lifting the crank. Be certain that you lift slowly, for that is the only way to secure a true test. Keep your ear open for the sound of escaping air. Watch out that you make this test after the engine has run for four or five miles. Why? Oh! well there are ways and means to increase compression temporarily, if the cause demands it. If at all possible use a compression meter, for in this way you can tell definitely how things are.

Examine the Cooling System

If all is O. K. in this regard, then look over the cooling system. Run the engine for a while at a fairly good speed, then inspect the water in the radiator. If it boils over, or steams considerably, watch out. Do not race the engine; let it run throttled down.

At this point give the radiator the once over. See that it is not a patched-up affair and that it does not leak. This holds especially true for the portion of radiator inside the hood. Watch it carefully for the past owner may have let it freeze a couple of times, and a patched radiator means a careless owner as a general rule.

Test for Miss-Fires

Next test the engine for missing or back-firing. Run it as slowly as you possibly can. If it will proceed without missing or back-firing, you can safely say the compression is good, and the spark plugs are O. K., and the electrical system is working all right. It also proves the carburetor is adjusted properly.

If the owner says "Well now—that's funny—it never missed like that before,—I guess that carburetor needs a *little adjusting*," look wise and reply.

"Yep—I guess so—adjust her a little and see how she goes."

Before leaving this point, let me impress on prospective owners the necessity of a slow speed test. Many a car has been sold on the strength of a test of high speed, a bunch of noise, and a line of smooth talk, the loud noise being described as "lots of pep and power."

When conducting the engine test, keep an eye on the exhaust. If this comes out in the form of a heavy black or blue vapor, it is not a good sign. It means that there is an escape of oil into the cylinders, or that there is excessive consumption of gasoline. Get him to thin the mixture, then see if the engine will function properly. Throttle it down, then make the owner give you an almost invisible vapor out of the exhaust. When this happens (if it does) watch the difference it makes in the performance of the engine.

A good method is to get your ear near (not too near) the exhaust pipe. Listen to the "put-put" of the engine. If it misses too much—accept no excuses. If the owner says it's a faulty spark plug, give him a chance to prove it but *do not buy* before you are sure.

A Parting Word

Lest you run away with the idea (from the foregoing remarks) that you have to look over the car in a fault finding manner, let me explain. Do not be a grouch; be pleasant, but be FIRM. Start your inspection at the head lights, and finish at the tail light. As a parting shot, let me warn you to make sure you are talking to the true owner of the car. This may sound foolish, but personally I bought a car which had a note registered against it. Finally I straightened the matter out, but it took time, money, and trouble. Either search the records, or else, demand a bona fide bill of sale.

Of course there are countless other things one could

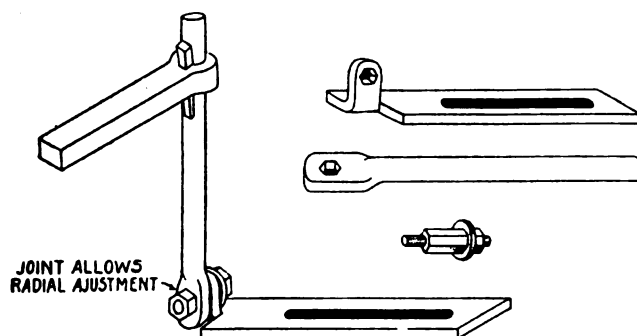
look for in purchasing a second-hand car, but if the above hints are followed out, any trouble that develops later will be a small matter. As a final word let me repeat: Keep a stiff hold on your good judgment, and do not let the bug of enthusiasm run away with you.



IMPROVED DRILL POST

By Charles H. Willey

THE sketches show a type of drill post old "old man" that we made in the shop which enables us to use the



Construction of Drill Post.

ratchet drill in any position desired and permits rigging up for drilling in places that would be very unhandy with the old type of "old man."

The feature of this post is the joint at A which is given in detail at B, C, and the hexagon bodied bolt at D. This bolt is simply a piece of hexagon stock turned down and threaded at each end and then on one end a large washer is put on and the nut pinned to keep it from turning.



Measures of Experience

When a young man says, "I'll take that matter up with the directors," he likely has been with his firm as long as a week. When he says, "Now, my experience in cases of this kind has been, etc.," he has been there longer—maybe six months. But when he says, "I dunno, but I'll ask the boss," he probably is an old-timer there, and the boss thinks the world of him.—*Kansas City Star*.



A fussy person is a chap that refuses to take a life preserver because there's a hole in it.—*Life*.



Poignant

"What you need is a tonic to sharpen your appetite," said the Doctor. "By the way, what is your occupation?"

"I am a sword swallower in a circus side show," replied the caller.—*Cincinnati Enquirer*.

The Transmission Gearset

How This Unit Is Constructed and How the Gears Should Be Shifted

By E. F. Ingram



THE gasoline engine differs from steam and electric power producers in that it cannot continue to give a very strong pull at low engine speeds. Since there are many times when the car must run slow and at the same time considerable work is required to propel it, as when a hill is being climbed or the car is being started, there must be some means of increasing the relative speed of the engine. This is the duty of the sliding gear transmission, or gearset, as it is sometimes called.

Both progressive and selective change speed gears are used at the present time, but the selective type is by far the most popular. In the progressive type, shown diagrammatically in Fig. 1, the primary shaft is in two parts, the forward or driving part, and the rearward or driven part, the latter being journaled at its forward and inside of the former. On the driven part of the shaft are mounted two gears, and one-half of the high speed clutch, these being in one piece and free to slide longitudinally but not to revolve on the shaft. On the driving shaft is a gear for driving the secondary shaft, and also the other half of the high speed clutch.

The secondary shaft serves as a counter shaft through which the motion is transmitted for low and intermediate speeds and for reversing.

For high speed the clutch on the rear part of the primary shaft is slid forward until it engages the clutch on the forward part of the shaft, thus locking the two parts of the shaft together. This gives a direct drive, the power being carried directly through the gearset without being transmitted through the gears.

The earlier types of gearsets had no direct drive, the power always being transmitted through gears. With this construction there was noise from the gears all of the time the car was in operation and there was also considerable power loss. With the three speed progressive gearset it is necessary when shifting from low to high or from high to low gear to pass through the second speed gear.

With the selective gearset this is avoided and the operator can select any gear that he wishes without passing through any other gear. This is accomplished by providing either two or three sliding sets of gears instead of one, the number depending upon whether three or four speeds are provided. In Fig. 2 a diagram of a three-speed selective gear-set is shown. When the progressive type of gearset is built to give four speeds forward the overall length becomes excessive, so that four-speed progressive gearsets have practically gone out of use.

Beginners usually have some difficulty in learning to shift gears though the operation is really a comparatively simple one. The proper method of shifting the gears on a car with a typical three-speed transmission starting with the control lever in the "neutral" position is as follows:

Place the left foot on the clutch pedal, and press down firmly, holding it in this position; with the right hand, shift the control lever first to the left, then back.

The gearset is now in the first or "low speed" position. Gently release the pressure of the left foot on clutch pedal and at the same time press down slightly on the accelerator pedal with the right foot to increase the speed of motor. As the clutch takes hold, the car will commence to move forward. Continue to press down on the accelerator pedal until the car gains some headway before attempting to change to a second speed.

When the car is well under way, disengage the clutch, at the same time releasing the pressure on the accelerator pedal to prevent the motor racing, and with the right hand shift the control lever forward and to the right, then forward again. Engage the clutch immediately and accelerate the motor as before. The car is now in second or intermediate speed.

Again accelerate the motor until the car is moving forward at a rapid pace; operate clutch and accelerator pedals as before; quickly shift the control lever straight back as far as it will go. The car is now in high speed which is the normal driving position.

To reverse the car, first come to a full stop. Release clutch and shift the control lever to the left and forward. Engage the clutch and accelerate the motor.

In shifting from a lower to a high gear, as in getting under way, it is important that the speed of the car be accelerated just before making the change, so that the two gears that are to be meshed together will be running at approximately the same speed. The proper handling of the clutch pedal and accelerator so as to make the motor "pick up" its load quickly, and at the same time prevent it from "racing" when the clutch is released, requires considerable practice.

In shifting from a lower to a higher gear, as in getting from a standstill, always let the clutch pedal come back gently. If the foot is suddenly removed from the pedal it will let the clutch take hold with a violent jerk.

In shifting gears, from one speed to another, the motion should be made firmly and without hesitation. If the gears fail to mesh correctly the first time, release the pressure on the control lever and clutch pedal for a moment and try again. With a little practice the various changes can be made easily and without noise.

Shifting from a higher to lower gear, or "shifting down" is accomplished in the same way as shifting up; that is by releasing the clutch, moving the control lever quickly to the proper position, and engaging the clutch. It will be found much easier to shift gears from higher to lower speeds if clutch pedal is pressed down only enough to release clutch.

Ordinarily the car is driven in high or third speed and first and second speeds are used only for starting. Occasionally, however, a steep hill, muddy or sandy road will be encountered which requires more power, and since it is for this purpose that the lower speeds are provided, the driver should not hesitate to use them.

Anti-friction bearings of either the ball or roller type are used very extensively in modern gearsets. A plane bearing is often used at the point where the rear part of the primary shaft is journaled in the front part, but ball or roller bearings usually are provided elsewhere.

At one time most cars were designed with the gearset as a separate unit, which was attached directly to the frame of the car or to a sub-frame. Thus the engine, gearset and rear axle formed three separate units. Later some manufacturers incorporated the gearset in the rear axle so that there was but two units, the engine and the transmission, axle as it was called.

Another arrangement adopted was that of attaching the gearset to the torque tube. A fourth arrangement developed was that of incorporating the gearset in one unit with the engine, thus forming a so called unit power plant.

All four arrangements are in use at the present time but the arrangement where the gearset is in a unit with the engine is by far the most popular. With this design

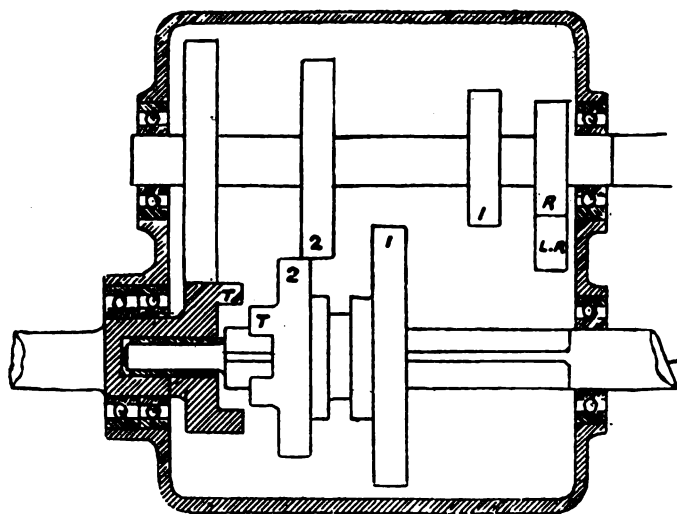


FIG. 1. PROGRESSIVE GEARSET

the power plant is usually supported at three points so that frame distortion has no effect upon it.

A disadvantage with incorporating the gearset in the rear axle is that it adds considerably to the unsprung weight of the car, which tends to effect its riding qualities. Owing to the fact that the rear axle is constantly moving up and down with relation to the frame when the car is in operation some difficulty is also experienced in arranging the control connections between the change gear

lever and the gearset so that they will not be effected by this movement.

Mounting the gearset on the forward end of the torque tube has some advantages. While it really forms a unit with the rear axle in this case, most of the weight is carried on the frame of the car. Also the movement of

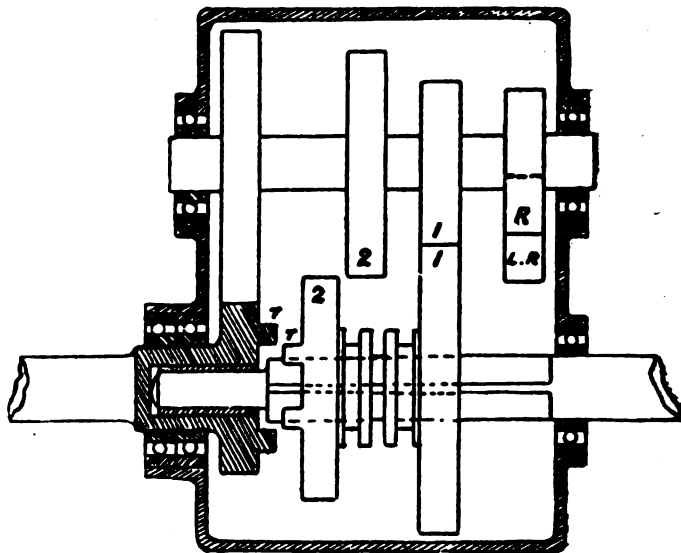


FIG. 2. SELECTIVE GEARSET

the forward end of the torque tube due to the movement of the axle is so slight that much less difficulty is experienced in arranging the control levers so that they will operate properly. The arrangement is probably lighter than where the gearset is housed in a unit with the engine. There are a few makers using unit power plants that do not house the gearset with the engine but join the crankcase and engine with a yoke running around the flywheel. This design also possesses the advantage of lightness.

If you expect other men to receive your representatives with courtesy and listen to the merits of your goods, never deny the same consideration to those who call upon you.

Stopping an advertisement to save money is like stopping a clock to save time. Advertising is an insurance policy against forgetfulness. It compels people to think of you.

Get your details right; the rest is a matter of detail.—*Napoleon.*

It may be further around the corners of a square deal, but the road is safer.

Acquire learning and culture, of course; but don't forget plain common sense.

Some people expect Life to pay them a dividend before they put anything into the investment.

Nuggets of Automotive Wisdom

Hints, Suggestions, Facts and Helpful Information Gathered by An Expert for Your Aid

THERE is a little card that the State supplies annually in addition to the license plates. It is fairly well known that this card should be carried when touring, or for that matter at all times, for this is the owner's identification and is accepted as such by police officials. Quite often, a peep at this card is demanded of motorists. So don't pigeon-hole this card.

Carry it on or in the car but back or clip it to some secret place as the under side of the seat box or in a pocket the entrance to which is concealed. Don't do as some enthusiasts do—tack the card on the foot board alongside the manufacturers name plate. I have seen this done, the owner innocently thinking he is complying with the law and having his card very handy when in reality he is inviting theft of the car for the thief potential has all the evidence the law requires to prove ownership when he spies a car so tagged—he can steal such a car and everything possible covers his getaway.



SOME men seem always to be on the wrong end of everything. Take Dr. Frank, for instance. He tried to start his car in the center of town one busy afternoon. He pushed the button and there was a noise of engaging gears but no other movement. He pushed and pushed but got no result. Finally, very red and somewhat peeved at the complimentary remarks of his friends, he called a garage and when two or three of the boys from the Empire came hustling up, they gave him the merry "ha, ha."

A rap with a hammer and the pinion gear, which had stuck, sprung back into place. "Kick her again Doc and put a little grease on the gears when you get home." Doc told me that he wouldn't get caught that way again—and since this often happens, most persons when they realize what it is, get out and push the car a few feet which action loosens the gears.

Doc was also told of the pushing stunt and when she refused to turn over another time, he pushed the car half the length of North Street before he was apprised of the fact that his battery was too far run down to turn the engine. Doc is of the opinion that battery men are sharks—well he did have a battery "charged" at Fred Smith's and it lasted so short a time that he had to buy a new one, on which Fred allowed him \$5 for the old one though Fred said it was only scrap—Doc must have known that Fred got his storage battery experience erecting telegraph poles and he had only himself to blame if Fred did sell the "scrap" battery for a good sum to some one else.

Then Doc got in wrong rebuilding a battery. He had been in some shop and had been shown the process of

putting in the new sheets of wood—all that was needed to make it good as new," the man told him. So when he had another battery go wrong, he rebuilt it himself—spent a lot of time and got his hands in bad shape from the acid; and the joke of it was that he rebuilt a battery that was entirely gone to begin with.



ORDINARY steel grease cups are formed from a disc of flat sheet steel and one of the operations upon the piece in the process is punching a hole through the end to allow the grease to be squeezed through.

If the user of these cups will have that hole in the end enlarged to the full size permitted by the inside of the threaded end, he will find that grease will flow more positively and that there will be less of it working out around the edge of the cap and on the fingers, this latter being the curse of the plain grease cup.

EXCEPT in the case of a revolving shaft, no first class job—a permanent job—ever was made with the shaft loose in the hole. Whether it's a gear or flywheel, pulley or lever, keys and set screws will not keep it tight if it is transmitting any power at all, if the shaft is loose—at least a light force fit is necessary to insure good permanent service. And the same is true of a bolt or stud—a tight original fit is better than all the locks in the world (but it costs more to produce).



SOMETIMES there is felt the need for an alcohol torch. Without enumerating general cases, the mechanic does need such an outfit at times—and usually when one cannot be had. But it is possible to make a most acceptable substitute from a small oil can and some wick. Clean the can thoroughly, partially fill with alcohol, and put in the wick—candle wick or lamp wick or even store cord cut to lengths. This makes a first class torch which will give a clean flame, some light, and be safer than any other kind of similar equipment. BUT, bear in mind that this is not to be used around cars or car parts where there is the least danger of gasoline fumes.



KINDRED SPIRITS

When you see two fellows nodding wisely at each other and then looking pityingly on the rest of the crowd, you can guess that they've just read Thomas Edison's statement that only two men in a hundred are intelligent.

—Cleveland Plain Dealer.

New and Useful Automobile Accessories

The New Bergougnan "Gold Seal"

The Bergougnan Rubber Corporation of Trenton, N. J., announces a new moulded casing to be known as the Bergougnan "Gold Seal" tire, which is to take the place of the former Bergougnan Wrapped Tread Cord.

This latest product of one of the oldest manufacturers of tires in the industry is a



departure from the tread design hitherto used, and is said to be the "farthest north" reached thus far in the race for tire perfection.

This claim is probably open to argument but it is presented by an organization with a record of twenty-five years of solid achievement, and as such merits consideration.

Besides the Trenton factory, the company operates plants in France, Belgium, Italy and Russia.

New territory is now being allotted.

Sparks

"Sparks" is the name of a little house magazine that is being published by the Eastian-Blessing Company, West Austin Ave., at La Salle St., Chicago, Ill. For those who are interested in the subject of better welding or cutting with the oxy-acetylene or oxy-hydrogen process, it should prove of great value, and we should advise them to write to this company for the latest issue of "Sparks."

Vision

A very fine house organ is "Vision" which is being published by the Wm. R. Johnston Mfg. Co., 451 East Ohio St., Chicago, Ill. The articles in it are not of the usual hum-drum type, and the subjects in the first issue range from artificial limbs to the latest Johnston product, a visible gasoline filter for Stewart vacuum tanks. Readers who are interested should write to this company for a copy of this splendid little magazine.

Greenfield Tap and Die Inaugurates New Service

As part of Greenfield Tap and Die Corporation's service to its customers, a carefully compiled and comprehensive telegraph and cable code has just been published. Although the code was originally intended for the concern's overseas customers, it is equally suited for its domestic friends, and will prove the means of materially reducing the cable and telegraphic expense of those who have occasion to order goods by wire.

The code as now published represents several years of work in classification of cables sent and received by the home office. It is a five-letter code, and so arranged that it can be combined with the majority of standard commercial codes. The highly technical nature of many of the GTD Corporation's products, which range from Screw Plates, Taps and Dies to Drills, Reamers, Gages and Machine Tools, makes it impossible to economically describe them by any standard code.

Not only does the new GTD code cover every item of manufacture by the concern, and the usual features relative to orders, quotations and financial matter, but also such pertinent items as exchange, technical terms of the trade, etc.

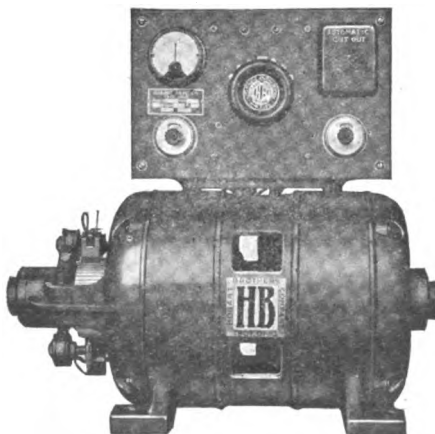
The code is included in the new No. 46-A catalog just issued by the Greenfield Tap and Die Corporation and is also separately bound. Coding of orders by the domestic trade will not only save words but will insure correct transmission of technical specifications as the code is self checking.

Copies may be obtained from the home office at Greenfield, Mass.

HB 8-Battery Charging Outfit

The latest addition to the HB line of Charging Appliances is the 8-Battery Automatic Charger. It is equipped with HB voltage control, automatic cutout, ball bearings, in fact all the features of the larger HB Charging Outfits.

Its output is 10 amperes and voltage from 6 to 50 volts. The makers, The Hobart Brothers Company, Troy, Ohio, claim the



outfit will pay for itself and earn a substantial profit at the same time and their terms of payment are very easy. Write them for particulars mentioning the AUTOMOBILE DEALER AND REPAIRER.

"Red Devil" Socket Wrench Set

A set that fits every bolt and nut on practically any car is being manufactured by Smith & Hemenway Co., Inc., Irvington, N. J., manufacturers of "Red Devil" Tools and hardware specialties. It is called "Red Devil" Socket Wrench Set No. 1973 and is an excellent set for the average car owner who wants to make his own repairs and keep his car in good order. The sockets are of drawn pressed steel, thin for clearance, and strong enough for the hardest usage.

Each set contains the following: unbreakable ratchet handle, long extension bar, short extension bar, universal joint, offset screw driver, thirty pressed steel sockets fit-



ting hexagon nuts and bolts of the following sizes: 9/32, 5/16, 11/32, 3/8, 13/32, 7/16, 15/32, 1/2, 17/32, 9/16, 19/32, 5/8, 21/32, 11/16, 23/32, 3/4, 25/32, 13/16, 27/32, 7/8, 29/32, 15/16, 31/32, 1, 1-1/16, 1-1/8, 1-1/4 inches; three pressed steel square sockets to fit 3/8, 1/2, 21/32 inch sizes, and one spark plug socket with 29/32 inch opening.

Hyrate Battery & Jar Gripper

The Service Station Supply Co., of 30-32 East Larned St., Detroit, Mich., are manufacturing an equipment for holding battery and jar and making pulling elements easy, known as the Hyrate Battery and Jar Gripper. The removal of an element from a battery jar almost invariably requires considerable force, due to the expansion or buckling of the plates. Even when the jar is so cemented to the battery case that the element may be taken out without removing the jar, with the Hyrate Gripper it is said to be easy to hold the battery while pulling out the element, and also exceedingly easy to hold a jar when same has been removed from the case.

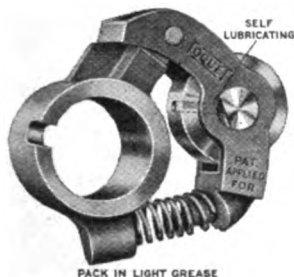
With the old method of holding the battery against the floor with one foot, while pulling out an element, the battery man often breaks covers. To attempt to grip a jar in this manner does not permit a strong pull, and often results in breaking the jar itself.

A convenient and up-to-date method of holding either a jar or a battery solidly is readily provided by the Hyrate Battery and Jar Gripper, which is readily adjusted to fit any size of battery made of high grade steel, and will last a lifetime. It does the work quickly and reduces danger of breakage, and saves labor and expense.

Toquet Timer Roller

A new toquet product has been placed on the market which has considerable merit. It is a Timer Roller which does not depart radically from the design of the regular Ford Timing Equipment. In fact the Toquet is simply an improvement which is said to correct the long evident faults in the construction of the Ford Timer Roller.

It is a well known fact that the wear on the Roller and the Timer Shell is caused by arcing. After grooves have thus been made in the Timer Shell the Ford roller,



suspended as it is beyond the spring, bounces considerably, causing the roller to jump the segments and the engine misses fire. A shell in this condition is generally thrown away.

Correcting this faulty construction, the Toquet Timer Roller is placed between the hinge and the spring with the roller slightly at an angle with the Timing shaft amounting to one-fourth inch to the circle. This makes the roller have a tendency to run off the race but held firmly on the shaft gives a slipping and rolling action. This it is claimed, will smooth out old discarded Timer shells and make them again useful or when used with a new Timer shell, prevent grooving. A further advantage of the Toquet Timer Roller is that the Timer shell can be packed with light grease which minimizes arcing. The Toquet roller is said to last the lifetime of the car, giving positive contact. This assures easy starting and a smooth running motor.

The Reliance Automotive Devices, Inc., 243 West 55th St., New York, who have contracted to market the various Toquet products report a steady and increasing sale on the Toquet "Safety-First" Oiling System which is a very simple and efficient aid



to the circulation of oil in the Ford engine.

The point is well taken that the regular Ford Oiling System is inadequate to the various demands made upon it, often falling down because it gets clogged up with foreign substances. Further disadvantage in the regular equipment is seen on steep grades where the gravity system refuses to operate. With the excess of power in the Ford engine it should be able to climb hills much better than any other car but through lack of oil overheats and loses power. The Toquet is claimed to give a forced feed at all times according to the speed of the engine and can be used independently or in conjunction with the regular Ford System.

Wedler-Shuford Equipment

The Wedler-Shuford Company, 19th and Locust St., St. Louis, Mo., is offering two new specialties to motor car owners.

Petry Heater and Tuning Up Valve

The Petry Heater and Tuning-Up Valve is the outcome of a demand for the proper heating of motor busses, gasoline propelled railway cars enclosed body automobiles and passenger airplanes.

This Heater and Tuning-Up Valve is attached on the exhaust pipe between the motor and muffler. A separate valve in the top of the device is adjustable from the driver's seat to divert the hot exhaust gases to heating pipes or radiators. A separate valve in the same device enables the operator to shut off the gases from the muffler for "tuning up" the motor. All of this is accomplished without back pressure and with no strain on the exhaust pipe.

Other uses to which the Petry Heater and Tuning-Up Valve may be put are:—the blowing of motor vehicle whistle or horns; and also, by means of flexible metallic hose, the thawing out of frozen fire plugs, water pipes, etc.—cooking, in fact, any use to which portable heat may be put.

This combination heater and exhaust valve obviates the necessity of placing two different valves in the exhaust line.

Several of the larger truck and motor bus manufacturers are installing Petry Heater and Tuning-Up Valves after thorough tests, especially the manufacturers of the big passenger busses requiring adequate heat in cold weather. It is manufactured by the N. A. Petry Co. Inc., 337 N. Randolph St., Philadelphia, Pa.

The Dot High Pressure Lubricator

The Carr Fastener Company Boston, 39, Mass., are marketing a high pressure lubricator which embodies a number of unique and pleasing features.

The high pressure lubricator system consists of the "Dot" grease gun and the special nipples which are placed at the various points where grease lubrication is necessary. The nipples may be had in a number of designs, straight, 90, 135 and 160 degrees, according to the point of the chassis where they are to be applied.

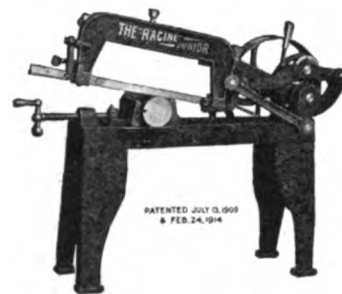
Each nipple is a ball check valve fitted with a heavy spring and a well fitting ball to prevent dust from entering the grease passage. The grease gun is made of extra heavy metal and is large enough to contain sufficient grease for even the largest car. It may be used with either grease or oil and is said to generate a pressure of over a ton per square inch. This enormous pressure will force the oil or grease to any point in the bearings.

A feature of the gun is its cleanliness in filling and operation. With the gun is furnished a specially designed scoop filler. This scoop is filled with grease by pressing it down into the grease can. The scoop is then transferred to the gun and by pressure upon a knurled handle the grease is emptied into the barrel of the gun without leakage.

In use the gun is slipped over and locked upon the nipple with a quarter turn of the wrist. Then the grease or oil is forced into the bearing by turning the plunger handle. Immediately the gun is removed from the nipple both the nipple and the valve in the gun close and no grease or oil can escape.

Racine Junior Power Hack Saw

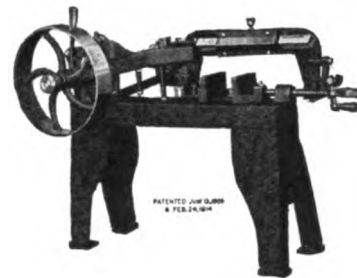
In the repair shop where it is desirable to cut steel discs from shafting, or where any type of hack-saw work is necessary, the power hack saw is a valuable machine. We illustrate a machine which is being made by the Racine Tool and Machine Co. of Racine, Wisconsin and called the "Racine Junior."



This tool occupies a floor space of only 38 by 12 inches and is 28 inches high over all. Its weight is approximately 175 pounds and it has a capacity of from 0 to 6 inches.

The saw frame, which will take blades from 10 to 12 inches, 21 gauge, is arranged to feed downward by gravity and to lift from the work on each return stroke, thus conserving the life of the blades. An automatic stop arrangement throws off the power when the work is done.

The machine, though fairly light, is so designed that it will do satisfactory work within its capacity.



Addition to Vulcan Line

A new 8-leaf Front Spring for Fords which will retail complete at a very low figure is the newest addition to the famous Vulcan line made by the Jenkins Vulcan Spring Company, Richmond, Ind.

This spring is known as No. 2010 and is plainly stamped with the Vulcan trade-mark carrying instant conviction as to its quality. It is interchangeable with the original Ford Front Spring without altering or substituting clips or shackles. While exceptionally



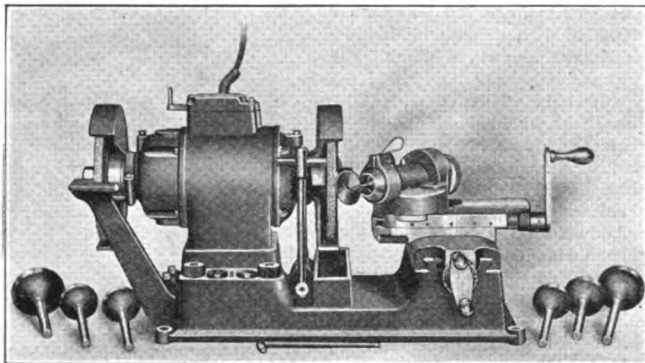
low in price the manufacturer has provided a liberal margin of profit for the dealer on this item.

Change of Name

Effective April 1, the Champion Ignition Company of Flint, Michigan, will be known as the A. C. Spark Plug Company. The change effectively ties up the long-established "AC" trade mark and product with the firm name.

The Collins Valve Facer

A combination valve facer and tool grinder is being made by Ford C. Close Co., Inc., of 2 Rector St., New York City, which we commend to our readers. This machine is, primarily, a unit grinding motor of $\frac{1}{4}$ H. P. made to operate upon direct or alternating current as desired. The motor spindle is fitted with a grinding wheel at each end.



The whole unit is mounted upon a base which also carries a movable carriage and jig for holding valves. The valves are held in place by means of a spring collet and may be set at any angle. While being ground, the valve is rotated automatically.

An accurate and dependable means of centering and holding the valves is provided.

Addition to Akron Rubber Mold Equipment

The Akron Rubber Mold & Machine Company of Akron, Ohio, announce they are now making a 4 $\frac{3}{8}$ " Mold; this new size being designed especially to handle the 4-inch cord and 4 $\frac{1}{2}$ inch fabric tires, with which so many makes of cars are now being equipped.

They also manufacture a 5 $\frac{1}{2}$ inch mold, which will accommodate 5 $\frac{1}{2}$ inch fabric or 5 inch cord tires, and which may be fitted with reducing shell to take care of 4-inch cord tires.

Through the use of Akron Rubber mold equipment it is said that the repairman with four molds can take care of any tire, cord or fabric, from 2 $\frac{1}{2}$ inch up to 5 inch cord inclusive.

Marketing Toquet Carburetors

Among those sharing in the return of prosperity is the Toquet Carburetor Corporation, of Westport, Conn.

A contract has been obtained by them on their products to the tune of one million dollars. The contracting party is the Reliance Automotive Devices, Inc., a New York State corporation with headquarters at 243 W. 55th St., New York City.

Mr. Gauthier, President of the Reliance Company and formerly an officer of the Toquet Corporation, in any interview with our representative gave some very interesting sidelights on the growth of The Toquet Company and the success that they have met in marketing the Toquet Carburetor. In order to take full advantage of the clientele, built up on the merits of the carburetor, other articles for the Ford Car are now being manufactured by them and will be marketed through the Reliance Automotive Device, Inc.

Reliance Company is primarily a selling organization dealing in the latest and most approved automobile accessories. They will in the near future publish a catalogue containing a selected line of such devices.

White Flame Spark Plug

The Carbo-Gas Company of Toledo, Ohio, has been very busy during the last twelve months in placing contracts and in fully testing its new and recent improvement in Spark Plugs. This company, through its engineer, has in past years patented various forms of plugs, each, a little better than the previous patent. At the present time they

have evolved and perfected, after numerous tests and experiments what they call The White Flame Spark Plug.

This plug is a well made plug of the usual size for various cars, having a large and heavy blue porcelain and surmounted by brass thumb nuts and connectors, unusual with spark plugs. As a rule plugs all have a very small brass connector for the terminal. Large terminals give a better contact and the brass and the peculiar make of the porcelains together with the bushing being a single piece forms a veritable transformer, actually raising the voltage derived from the coil and battery or magneto, producing an intensely white hot, thick spark, having a wonderful heating power.

It is well known in scientific circles that the white heat of an arc lamp or an incandescent metallic filament is the hottest heat known to science. Such a white heat produced between the terminals of a spark plug in the presence of poor gas, speaks for itself as to what it will do in quick explosion in burning itself clean and the economy caused by the rapid fire of the gas and the compression of the cylinder.

The plug has been demonstrated to electrical engineers, and experts of well known electrical concerns, to car owners and dealers and what is most important to chauffeurs and drivers and all have been very enthusiastic on the plug.

The plugs are being manufactured at Toledo, Ohio, but capitalists in the city of St. Louis are looking forward to having these plugs manufactured in that city.

All sorts of emphatic claims and statements may be made regarding the White Flame Plug with perfect truthfulness. A white hot flame spark produced at the terminals of a spark plug is as different to an every-day spark plug as the incandescent electric light is against an oil lamp.

Twelve-Eighty

In the latest issue of "Twenty-eighty," published monthly by the Vesta Battery Corporation, 2100 Indiana Ave., Chicago, Ill., there are many fine articles of interest to battery service station owners. In particular, they are featuring a Warning Chart which they have prepared cautioning the motoring public against being defrauded by "dope electrolytes." We believe the Vesta company will be glad to send a copy of this chart to any one writing for it.

Reed Inside Micrometer Calipers

The Inside Micrometer Caliper, most generally used in obtaining internal measurements of cylinders and rings, is equally useful in taking linear measurements, testing for parallel surfaces, comparing gages, making comparisons for fits, setting calipers, etc.

Until recently the Inside Micrometer has not been listed as one of the products of the Reed Reliable Line, but incessant call from the trade has induced Reed Small Tool Works of Worcester, Mass., to bring out such a tool. In the development, the demands of practical use have been met by incorporating the new features herein described.

In the construction of the barrel, spindle and thimble of the Reed Inside Micrometer, the regulation diameter of those parts as found in the Reed Outside Micrometers is used and is particularly adaptable to garage and repair shop use, while the larger surfaces allow for figures of a more generous size on the sleeve and barrel. The tool is graduated to read to thousandths of an inch with the same high degree of accuracy found in all Reed Micrometers.

One feature, found only in the Reed, is the possibility of instantly changing the position of the detachable handle to make it convenient for right or left-handed work, so as always to present the figures on the barrel in view for easy reading. The handle makes it possible to take measurements in holes and other inaccessible places or to gage throughout the entire length of a cylinder bore, thus giving a better average measurement.

The Standard Set, packed in a pasteboard box, consists of the Inside Micrometer, an adjusting wrench and five rods, giving a range from three to eight inches by thousandths. Additional rods can be furnished for measuring greater lengths, also a handle to make possible the gaging to greater depths in cylinders.



Very compact cases, covered with black book cloth and lined with black cotton plush, can be supplied and will be found to be a convenient protection for the Inside Micrometer in its every day use.

Together with the usual Reed Guarantee of complete satisfaction the exceedingly reasonable price makes the Reed Inside Micrometer a very desirable and profitable possession.

Greb Rear Axle Press

The Greb Rear Axle Press, which is manufactured by the Greb Company, 197 State Street, Boston 9, Mass., is designed for removing axle and drive shaft gears and pressing on axle gears. This Rear Axle Press No. 12 has a capacity of shafts up to one and one-quarter inches and gears up to six and one-half inches.

Garco Asbestos Products

Asbestos is one of the most interesting and unique of all minerals and one destined to play an important part in engineering, whether stream gas or air or electricity as well as modern transportation by automotive vehicles. The manifold uses of asbestos have only been developed and exploited since the late seventies, but its peculiar qualities have been known for many centuries and were demonstrated as ancient history discloses.

Some of our forebears, especially of the Roman Empire, used Asbestos Cloth, which was crudely woven by hand, to wrap about the dead before cremating as the cloth would not be consumed and in it the ashes of the dead could be preserved.

Legendary records show that asbestos cloth was known to some in the middle ages, as Emperor Charlemagne during his conquest of Central Europe used it effectively to impress some of his chieftains. He gave a banquet for them and caused the table to be covered with an asbestos cloth. Immediately after the meal was over he cleared the table by throwing the cloth into a blazing fire and to the amazement of those present he drew it out in a few minutes without its even having been scorched.

The origin of asbestos has never been determined. There are many varieties or classes, and these are divided into families. The asbestos of commerce is known as Fibrous Serpentine or Ghrysotile, which is Hydrated Silicate of Magnesium containing relatively little iron, aluminum and calcium. Its color is sometimes variegated, but is mostly green or yellow. It abounds in the Canadian fields, also in Arizona, California and sections of Africa.

Our chief source of supply is in the Province of Quebec, Canada, where the asbestos is generally quarried in large open pits or mines. The fibre is in lodes or fissures in the rocks and sometimes in strata. To separate fibres from the useless rock air drills, dynamite, hoists, locomotives, crushers, blowers and human hands are employed. Millions of tons of rock must be removed to obtain one hundred thousand tons of asbestos crude, which when separated and graded, will yield but a possible three thousand pounds of spinnable crude fibre of a quality suited to our requirements.

We get these high grade crudes and fibres down from Canada in enormous quantities. They are first put under heavy crushers and fiberized. They are then put through various processes and carded and spun into yarns both plain and wire inserted. These yarns are woven into cloths and tapes of various types best adapted to the purposes for which they are intended. All of these operations are conducted in the General Asbestos & Rubber Company, factories at North Charleston, South Carolina.

In these factories Garco Asbestos Brake Band Lining has its inception. A special wire spun yarn is used in the weaving of Garco Brake Band Lining Tape. All of this tape is woven to the required width but at least one-thirty-second full of the finished thickness. It is solidly woven and by a process which makes it equal to a homogeneous material. This construction makes Garco from ten to twenty per cent heavier than most other linings and insures for it a much longer life in service.

Garco Tape is treated with a saturat-

ing compound which makes it water, oil and acid proof and adds to its wear resisting qualities as increasing its coefficient of friction. After being thoroughly treated and cured the Tape is compressed from its over size to the required thickness.

The finished product is Garco Asbestos Brake Band Lining, a solidly woven, dense material which can be counter sunk for rivets; its braking surface is uniform insuring an equal distribution of pressure when the brakes are applied; it wears evenly and brakes efficiently until worn down below the rivet heads holding it in place; it will not burn out or heat; it gives off no offensive odor of burning rubber, such as a rubber saturated and stitched lining will when heated; it contains no cheap binder such as a folded lining, for it is composed of asbestos and metal which have no odor, are heat proof and hold with a sure grip when the brakes are applied.

New Line of Heavy Duty Air Compressors on Market

Announcement is made by The United States Air Compressor Co., Cleveland, O., of an addition to their line consisting of Single and Two-Stage Heavy Duty Water Cooled air compressors having capacities from 18 to 50 cubic feet per minute.

They are suitable for large garages, machine shops, factories, etc., having many compressed air outlets for tire inflation, cleaning purposes, operating air tools, air hoists, or other pneumatic machinery. Of the two types the Two-Stage equipment is capable of delivering the greater pressures.

The design of this Mammoth Line is very compact. The construction is sturdy and the manufacturer calls particular attention to the ease with which accessibility is obtained to interior parts. Valves can be removed for inspection by the removal of three screws. Main bearings are split on a 45 degree angle and provided with adjusting shims. The entire bearing is keyed into position and can be easily removed and replaced. Main bearing caps are also provided with oil reservoirs into which oil is splashed. These reservoirs feed a continuous stream of oil into main bearings.

The outstanding features described in recently issued literature are: Overload Relay which is said to provide absolute protection against overloads of all kinds. The unit is amply cooled by means of a hopper of sufficient capacity to require refilling very infrequently. The cooling Hopper is made a part of the compressor which eliminates any tanks, hose, or dripping connections. In the event of heavier, continuous duty, requiring greater cooling, threaded holes are provided for circulating water pipe connections. In addition to water cooling, a fan fly wheel of generous proportions bathes the compressor in circulated air.

The Usaco Automatic Controller can be set to start and stop the compressor at any desired pressure. The Usaco Air Pressure Release working in conjunction with the automatic controller permits equipment to start against no pressure and to pick up its load gradually. This device also discharges any oil, dirt, or moisture which may accumulate in the oil trap, assuring that only pure, dry air enters tank.

Special foundations of masonry or concrete are not required as the Mammoth De Luxe equipment is mounted on a heavy iron base.

All parts such as the crankshaft, the connecting rod, belt tightener, bearings, valves,

etc., conform to a design in relation to the whole. Material and workmanship are said to be of the highest order and in keeping with the reputation of the De Luxe Line of air compressors.

The Mammoth Compressor unit only for line shaft or direct motor drive is being marketed in both single and two-stage design.

Complete information about these outfits can be obtained by addressing The United States Air Compressor Co., 5306 Harvard Ave., Cleveland, Ohio.

A New Disc Wheel

The Perfection is a resilient, laminated steel disc, demountable wheel, with several new and interesting features. It is made up of lamination of steel discs welded together said to give great strength and lightness. The shape and "cut outs" in the outer diameter of the disc next to the rim, allow for considerable resilience unusual in this type of wheel, the load being suspended as in a wire wheel. It is claimed that this resilience allows for easier riding and tire economy.

As an added feature the valve stem extends through the outside, facilitating inflation of tires. These wheels can be quickly mounted on the wood wheel hub and are demountable for quick tire changes.

The wheels come in sets of five. Exclusive agencies are given to car dealers for their particular type of wheel, territory now being allotted for the coming year.

The wheel is manufactured by the Perfection Motor Parts, 418 Lightner Bldg., Detroit, Mich.

Stromberg Gasoline Filter

The great amount of dirt, water and other foreign substances found in present day fuels for gasoline engines and the trouble, delays and expense resulting therefrom have prompted the Stromberg Motor Devices Company, 64 E. 25th St., Chicago, Ill., to place on the market a Gasoline Filter with many novel and practical features.

The Filter is so designed that the fuel passes from the Vacuum Tank or any other source of supply into the trap or sediment chamber, thence through a very fine wire gauze to the outlet, all dirt, water, etc., being held in the cup and prevented from passing out by the screen. It is thus said to insure a clean and thoroughly filtered supply of gasoline being fed to the carburetor.

In addition to the qualities as a filter this device is equipped with an automatic shut off valve which closes off the gasoline supply by the removal of a knurled nut on the bottom designed for hand operation. A convenient place for shutting off gas supply is something very desirable but found on few makes of cars.

By pushing up slightly on the projecting part of the valve stem a supply of gasoline is made readily available for any of the many purposes necessary, such as priming, washing plugs, tire patches, etc.

The nut on the bottom of the strainer can be removed readily with the fingers and thereby shutting off the gasoline supply a positive, simple and effective means is provided for locking a car.

The strainer can be easily and quickly attached by any one to all makes of cars, and the three different means of installation on bottom of vacuum tank, to carburetor or in gas line makes this device worthy of investigation.

The Knorr Detachable Coupling

This invention is a metal hose coupling said to be readily detachable and leakproof, applicable to metal lined gasoline hose. In its standard form it is capable of withstanding pressures of over 450 pounds per square inch of hose area and may easily be designed for pressures exceeding 1200 pounds per square inch. Having no projections, it makes an ideal coupling for hose used with pneumatic tools.

The distinctive features of the coupling are as follows:

Three or more strong, light arms of stamped steel are made to closely embrace the end of a hose of any given size outside. These arms are held in place by a light steel ring. The steel arms or jaws are made to grip the hose by means of a wedge or spreader-nut threaded on the shank of the coupling and forcing out the arms at the outer end. This lever combination enables the user to exert a great and easily adjusted pressure on the hose and also enables him to quickly remove same by simply turning the wedge-nut a few times.

The shank or body of the coupling thins out at the hose end and is provided with threads firmly engaging the interior metal lining of the hose at its joints by screwing into the same. The portion of the coupling inside the hose carries comparatively little pressure and is consequently made so thin as to reduce the hose area by a negligible amount.

In the case of gasoline hose it has been found that failure of the hose frequently occurs through the attack by gasoline on the rubber in the hose at the end inside the coupling. This is guarded against in The Knorr Detachable Coupling by means of a leather gasket tightly wedged against the end of the hose by means of a brass sleeve cupped at the end holding the gasket and forced into place by the wedge-nut which also operates the clamping mechanism at the same time. This device is simple, effective and automatic.

The device is manufactured by the Barlow Manufacturing Co., 114 Park Place, New York, and further information can be obtained from them.

The Malco Windshield Cleaner

The man who does not equip his car with a windshield cleaner of some sort is flirting with death because one never knows when fog or rain will obscure the vision.

The Malco, 3 in 1, windshield cleaner has a number of excellent points in its favor. This device, which is marketed through the sales department of the Stacey H. Cosley & Co., 105 N. Clark St., Chicago, Ill., is so designed that it can be used on practically any type of windshield and on either open or closed cars.

The Malco is fitted with a clamp for attaching it to the top of the shield, or the clamp may be removed and the device attached through a hole in the closed car top, as desired. The moving handle is adjustable so that any degree to tension can be had. The wiping bar carries two pieces of rubber, mounted "V" shape, so that one wiper removes the water, the second the moisture or fog and the shield is wiped fully dry.

A big feature of the device is the mounting of the wiping bar which can be raised or lowered as desired to cover practically any part of the shield. This bar acts upon a swivel so that the contact with the shield is even at all points.

Ahern Timer-Wire Guard

The M. J. Ahern Co. of 13 Columbia St., Ansonia, Conn., are marketing a device which should interest every Ford car owner, this device is called the "Ahern Timer-Wire Guard." Every Ford owner knows that the present Ford timer system has its drawbacks, the timer wires rest upon the dust pan and are soon soaked with oil and grease.

The Ahern Timer-Wire guard, however, is designed to obviate all timer wire troubles. This device is made to clamp over the regular Ford timer in such a way that all wires are fully protected. An opening at one side of the guard permits the entrance of the wires. This opening is high enough to hold the wires from the dust pan. With this guard and a length of circular loom covering, the Ford owner should be able to keep his ignition system in excellent order.

Gier Tuarc Steel Wheel

A vexing problem in steel wheel construction is solved by an invention now being applied to the Gier Tuarc Steel Wheel.

Hitherto, where rim bolts were used on this type of wheel, the bolt was virtually an integral part of the wheel. Not infrequently rim bolts are stripped by the over-strong drivers in applying the wrench. This formerly meant a machine job in replacing the bolt.

In direct contrast, it is said that the new Tuarc bolts are as easy or easier to replace, than the bolts on any other type of wheel.

This is accomplished by using a special rim bolt with a hook-shaped head. This head hooks into a slot in the wheel felloe, and is drawn up tight by the application of the Tuarc clamping ring.

A light metal clip, used to hold the bolt in place is all that needs to be removed, if replacement of the bolt becomes necessary.

Full information covering this wheel may be obtained from the Motor Wheel Corp., 701-735 E. Saginaw St., Lansing, Mich.

Resigns as Western Sales Manager of American Bosch Magneto Company

The A. H. Petersen Manufacturing Company, whose factories are located in Milwaukee, announces the appointment of Mr. William G. Brown as General Sales Manager. The Company manufactures a portable electric drill and other tool specialties, known as "Shooter Products."

Mr. Brown's wide experience and acquaintance in the automotive industry is particularly fortunate, as this field constitutes one of the principal sale channels for these products and others which the Company is developing.

For the past eight years Mr. Brown has been with the American Bosch Magneto Company, having resigned as Western Sales Manager from their Chicago Office, to take up this new work.

The A-L-T Sunbeam Visor

which has recently been brought out by Thoma & Son, Inc., Fairfield, Iowa, has a number of features which distinguishes it from other devices of this kind.

For one thing it is made of Pel-lock ribbed glass in amber and green, and the color is in the glass; not flashed or stained. It is claimed that the ribbed surface dif-

fuses the light, deflecting a faint glow downward toward the driver's lap

The fittings are made of brass and are heavily nickel-plated. The visor is made in a complete range of sizes to fit any car in America with the exception of the open Ford model.

Full information in regard to this attractive and practical visor may be obtained by writing direct to the address given above.

Vellumoid Sheet Packing

Vellumoid Sheet Packing is not a new product, for Vellumoid gaskets have been used for years by a great many of the leading manufacturers of cars, trucks and tractors. It is now being used widely by repair garages for gasket work on every type of connection except the Cylinder Head and Exhaust.

The advantages of Vellumoid as an all around gasket material are many. It is made especially for automobile gasket work and is said to be proof against oil, gasoline and water. It is the only type of packing that oils will not deteriorate.

It also has splendid compressibility, taking care of all roughness in the flanges.

Its toughness is particularly pleasing to the garage mechanic for it is claimed that a Vellumoid gasket will not tear nor pull apart when being put into place.

Shellac is not necessary and this eliminates a good deal of flange scraping that is never easy nor pleasant.

The price is low, so low that the difference in cost between a Vellumoid gasket and a paper gasket is infinitesimal as compared with the cost of any repair job.

It is possible to obtain Vellumoid gaskets ready cut for the crank-cases, gear covers, etc., on the leading makes of cars, but for general repair work the sheet form is preferred. The 1/32 inch thickness is sold in 36-inch widths, and in rolls or sheets to suit the individual garage.

National Front Wheel Bearings

The National Bearings Company of Lancaster, Pa., are making a front wheel ball bearing to fit Ford, Chevrolet, Oakland and Dort cars which has a number of interesting features.

This bearing, which is in reality a bearing retainer, consists of a steel housing which fits inside the cups and cones and conforms to the outline of those units fairly closely. The retainer is fitted with recesses in each of which is placed a steel ball. New balls may be put into place should the old ones wear or break.

The Ryla Easy Opener

Ford and Chevrolet car owners who have experienced the common trouble of sticking doors will appreciate the accessory which is being made by The Mand Company, 1410 Fidelity, Baltimore, Md.

The device mentioned is called the Ryla Easy Opener and is designed for application to the door handle of the Ford or Chevrolet cars. The opener drives upon the hand and presents a hook at the top edge of the door. The longer leverage makes the opening of the catch an easy matter.

The Turn-Auto

The Turn-Auto, a device which is being sold by the Turn-Auto Corporation of 149 Broadway, New York City, is a practical machine which should eliminate the need for creepers and pits and make the repair of an automobile a practical "handy surface" job. It enables the mechanic to work in a natural position, on any of the underneath mechanism of the car as easily as though the parts had been taken out and were on the bench.

The Turn-Auto is a steel cradle upon which the car may be run by its own power, or pulled by a winch which is part of the device. The chassis of the car is then secured to the track by means of chains and turn buckles, and the car may then be turned to any angle up to 90 degrees by means of a shaft and suitable gears.

Repairmen will easily appreciate the fact that this machine is as much of a utility tool, where work on cars is being done, as the engine stand which has recently come into its own.

New Faw Catalogue

J. H. Faw Co., 27 Warren St., New York City, have just issued a very attractive catalogue covering all material manufactured and sold by them. This should be very interesting to the trade for it covers this company's complete line and is very neat and compact.

One scarcely thinks of the name "Fawco" without thinking of "wrenches," so well known is this product of theirs, but a glance through the catalogue shows that they also handle ignition cable, auto fuses, hose clamps, battery connectors, search-lights, switches and many other automotive accessories. Readers should write for this catalogue No. 5, and there is no doubt but that they will find it handy and extremely useful.

New Spark Plug Cabinet

To increase the value of an unusually strong advertising campaign, the manufacturers of A C Spark Plugs have brought out a unique and ingenious counter cabinet that is to be known as the "A C Quick Seller."

Because this cabinet was designed and decorated to preserve the impression of all A C advertising, it provides an efficient tie-up between the pages of leading magazines, billboards and the store dealer who sets it up.

The "A C Quick Seller" is made to hold a complete line of A C Spark Plugs from which any make or model engine can be equipped. Inside the cabinet is a simple chart that shows at a glance the correct plug for every motor.

Dealers who have already installed the A C Quick Seller report another valuable feature of the cabinet, pointing out that the dealer can tell at any time exactly the condition of his spark plug stock. This facilitates ordering and invoice. The Quick Seller also preserves the package, keeping it intact so that the customer may be absolutely certain that he is getting the genuine article.

The A C Quick Seller is being offered through all jobbers who handle these plugs. Additional information concerning it will be supplied upon request to the Champion Ignition Company, Flint, Michigan.

The Nathan Comfy-Crib

Although the older members usually enjoy a spin in the automobile, a hot day the baby does not relish being tossed around from lap to lap, nor is it possible to give the baby his accustomed nap in comfort, in the automobile without suitable facilities.

The Nathan Novelty Mfg. Co., of 55 Fifth Ave., N. Y. City, is making a comfy-crib which is well worth investigating by every automobile owner, who at the same time is the proud possessor of an infant. The Comfy-Crib is made of dark grey auto cloth and hung upon a frame of steel. The frame is so constructed that the cloth may be taken off, very easily, for washing.

The Crib is suspended from spiral springs and hung upon light, but strong chains. The whole combination is such that the crib rides with a maximum of comfort while hung inside the car, from the top irons. The crib can be hung in the house or on the veranda and is not limited to use in the car. This makes the device an all-around proposition which is a good investment.

Alben Combination Anti-Glare Shield and Mirror

The Alben Combination Anti-Glare Shield and Mirror which is manufactured by the Alben Mfg. Co., 7016 Euclid Ave., Cleveland, Ohio, is a very attractive device and should meet with the approval of all who drive cars.

This device consists of a rectangular mirror, three by seven inches which is easily attached to the top of the windshield, in the center. In this position the entire roadway, from curb to curb is visible, instead of a small section on one side as is the case when the mirror is only a side one.

A touch of the finger drops the Alben glare shield and the bright lights of an approaching car do not blind the driver. This is also useful in preventing the reflected light from wet pavements, and the glare of the sun, from dazzling the eyes of the driver.

Readers will do well to investigate this product.

Thomson Spot Light and Control

It is claimed that the Thompson spot light and control, manufactured by the S. H. Thompson Mfg. Co., Fourth and St. Clair Sts., Dayton, Ohio, gives the driver, while in driving position, complete control over the spot light's rays.

The device is made for both open and closed cars and the fact that it can be easily controlled from the inside of the car without the driver having to reach out and make adjustments should make it worthy of consideration.

It is well built, all exposed parts being made of bronze, nickel plated and is durable and light in weight.

It enables the driver to follow the road signs with ease at night because he can direct the spotlight's rays so that the roughest roads can be driven over with the same safety as is possible during the day. Further information relative to the ingenious device may be obtained by writing to the manufacturers.

Boston No. 3 Socket Set

A most complete socket set is being manufactured by the Boston Auto Tool Co., 17 Tudor St., Cambridge 39, Mass., called "The Boston" No. 3. This socket set is made of a special steel and the sockets are heat treated.

The sockets are much shorter and are tapered to a thin edge, permitting them to be used in places where it is claimed sockets could not be used before, and it is said when used in connection with the extensions, "T" handle, Ratchet and universal joint, there is no bolt or nut that cannot be reached.

All tool ends have spring pressed friction balls, which hold the various combinations in place. Some 290 combinations can be made with these tools.

They are sold with the understanding that if a socket should break, it will be replaced if the broken piece is returned to the manufacturers.

Universal Hose Clamps

One reason for the popularity of the Universal Hose Clamp which is manufactured by the Universal Industrial Corporation, Hackensack, N. J., is the fact that this clamp will fit any hose from one inch to three inches and up to six feet in diameter.

The device comes in two sizes, the "Junior," one-quarter inch to one and one-half inches, and the "Senior" one inch to three inches. It consists of a band of tough, cold rolled ribbon steel, a bolt and nut. There are holes every five-eighths of an inch apart in the band with scores between them.

It is only necessary to clamp the band around the hose, insert the bolt in the nearest hole, tighten up on the nut and then break off the over-lap.

Non-Skid Pedals

If you believe in non skid tires you surely must realize that the same principle could be applied to brake and clutch pedals to great advantage. Have you not often had your foot slip from the metal pedals? Then again, the metal pedal soon wears a hole in the sole of your shoe if the latter is not protected.

To obviate these troubles the Auto Pedal Pad Co., Inc., of 318 West 52nd St. N. Y. City, are marketing a corrugated rubber pad, mounted in a nicked frame, for attachment to clutch and brake pedals.

Schrader Announcement

To correct an impression which may exist in the minds of our readers, we have been requested by A. Schrader's Son, Inc., of Brooklyn, New York, to announce that a substantial price reduction has been made on their products, as per the following schedule:

Schrader Universal Tire Pressure Gauge from \$1.50 to \$1.25
Schrader Universal Truck Tire Gauge from \$2.00 to \$1.75
Schrader Universal Valve Caps from \$4.00 a box of five to \$2.50
Schrader Universal Valve Insides, from \$4.00 a box of five to \$3.00

This statement will undoubtedly be of great interest to the trade.

Classified**Advertisements**

Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange at the uniform price of seven cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than one dollar, however small.

Remittances may be made in postage stamps or in any convenient way.

Special rate of 40 cents per non-pareil line for each insertion if taken for 12 consecutive times.

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murry Street, New York

Classified**Advertisements****Patent Attorneys**

DON'T LOSE YOUR RIGHTS to patent Protection. Before disclosing your invention to any one send for blank form "Evidence of Conception" to be signed and witnessed. Form and information concerning patents free. Lancaster & Allwine, 212 Ouray Building, Washington, D. C. "Originators of the Form 'Evidence of Conception'."

PATENTS—Send for free booklet. Highest references, best results. Promptness assured. Send model or drawing for examination and opinion. Watson E. Coleman, Patent Attorney, 624 F St., Washington, D. C.

PROTECT your rights. Write for "Record of Invention" which contains form to establish evidence of conception of your invention. Prompt personal service. Preliminary advice without charge. J. Reaney Kelly, 612-E Columbian Building, Washington, D. C.

PATENTS PROCURED AND TRADEMARKS REGISTERED—Eighteen years' experience. Instructions and Terms on request. Robb, Robb and Hill, Attorneys at Law, 888 McLachlen Bldg., Washington, D. C. 1340 Hanna Bldg., Cleveland, Ohio.

PATENTS SECURED—C. L. Parker, Patent Attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

Charging

REMAGNETIZERS for all magnetos Fords charged while engine is in car. Thousands in use since 1915. Endorsed by trade schools, U. S. Government, garages everywhere. Generates 225 pounds magnetic pull from six volt battery. Dry cells operates. Guaranteed List price \$8.50. Liberal trade discount. Distributors wanted. Benner Manufacturing Co., Webb City, Mo.

Accessories

MAGNETO WRENCH AND KEY KIT. A necessity for every garage and repair man. Send for circular. Atlantic Automobile Supply Co., Atlantic Highlands, N. J.

Auto Mailing Lists

DON'T BE MISLED. But buy Massachusetts Motor Vehicle Registrations direct from the original publishers. Whole State or by Counties, Cities and Towns. 1921 lists. Auto List Publishing Co., 138 Pearl St., Boston, Mass.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice of four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Wanted

WANTED—Men with Ford cars to sell Stokes Carburetors. Exclusive territory given. Write for particulars. Stokes Carburetor Co., Inc., Good Ground, Long Island, N. Y.

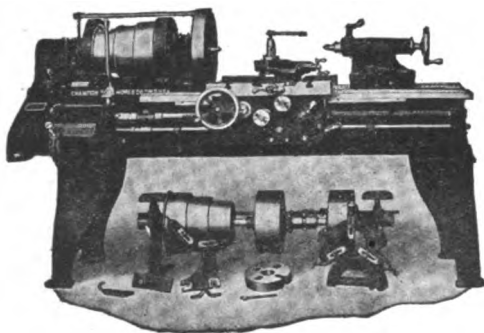
WANTED—High grade salesman to call on the jobbers of the country with a high grade line of All Steel Bodies for trucks and Ford roadsters. The N. G. V. Company, Galion, O.

Agents Wanted

AGENTS—We pay \$9 a day taking orders for Insyde Tyres. Best and easiest seller ever put on the market. Guaranteed to give double tire mileage. Any tire. No punctures or blowouts. Every auto owner buys on account of low prices. Enormous demand. Write quick for agency. American Accessories Co., B-6 11, Cincinnati, Ohio.

Opportunities

COMPTON SPRING OILERS sell on sight. Prevent broken springs by automatic lubrication. Clean out rust. Stop squeaking. Make smooth riding. Quickly attached. Send your order today and convince yourself. Send \$4.00 complete set of eight. Special Ford set \$2.00. Dealers discount credited on your first stock order. A money maker for you. They sell fast. Compton Company, 29 Broadway, New York.

CHAMPION LATHES

For your garage and equipment work, you must have a lathe that can be depended upon at all times. A machine that is accurate, convenient to operate, and not equipped with unnecessary trimmings. Such a machine we offer in the Champion Lathe at an attractive price.

Made in four sizes 12" to 18" Swing

Catalog gladly sent on request

Champion Tool Works, Cincinnati, Ohio
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COSTS \$2.50 PROFIT \$27.50

That's what you make by transferring decalcomania monograms on autos. Every motorist wants his car monogrammed. An artist charges \$5.00 and can't do as good work as you can do for \$1.50. No skill is required; no experience. Spare or all time. Circulars, full instructions, etc., free. Write for free samples—or send \$2.50 for outfit by return mail.

AMERICAN MONOGRAM CO.
Dept. 131 East
Orange, N. J.

SAMPLE FREE

The Rentz Spark Plug

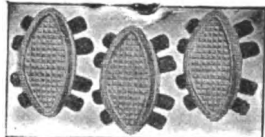
In the past many manufacturers have produced spark intensifiers to be used in conjunction with spark plug and now comes the Rentz Spark Plug Co., Inc., of Atlanta, Georgia, with a plug which contains a spark intensifier of its own.

The Rentz plug is made in standard sizes and consists of the conventional housing and porcelain with a center electrode held in by means of a lock nut and made compression tight by two gaskets.

Fitted to the top of the plug is a cylinder of heavy glass, treated to resist the heat. A fitting on the top of the glass cylinder carries two insulated handles. The first handle is threaded and mounted at the center of the glass tube. By turning this handle down the spark gap can be adjusted as desired, depending upon the type of engine in which it is installed.

A second handle, located at the side, serves to short circuit the plug when the engine is being tested for a missing cylinder. The manufacturers claim that an actual test has shown a saving of three miles to a gallon of fuel, when this plug was used.

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"RICO"
Ford Pedal Covers
one set will out-
wear three sets of
any other kind.
Price per set of 3-75c
Rich Mfg. Co.
69-71 Greene St., N. Y.

LYON RESILIENT
BUMPER

Famous patented opened loop-and
construction quickly and easily at-
tached to any car.
METAL STAMPING COMPANY,
Long Island City, New York.

"RICO"
 Ford Pedal Covers
 one set will out-
 wear three sets of
 any other kind.
 Price per set of 3—75c
Rich Mfg. Co.
 69-71 Greene St., N. Y.

LYON RESILIENT BUMPERS
 Famous patented opened loop-end
 construction quickly and easily at-
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METAL STAMPING COMPANY,
 Long Island City, New York.

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March



FLIVVER BLOSSOMS

SPEAKING of Spring, though at the present writing the thermometer is carrying its spirits in its toes, and no one expects Spring for some weeks yet, but the young lady is bound to visit us next month. She will probably bring us a healthy crop of flies, wasps and other things just as welcome. So we intend to till our soil and produce a few flivver blossoms; in words of one cylinder, our next issue will be the special Ford number.

We stop the wheels of progress just once each year long enough to hurl a few remarks at what was once the nation's popular car. For a serious matter, the flivver certainly holds high honors in our mirth provoking contest. If someone thinks of a new joke, they immediately try to link it up with the flivver. But that is one of the characteristics of the American people, to make a joke out of a calamity.

The lowly banana peel, for instance, nestling quietly beneath the foot of a ponderous but dignified gentleman, will always call forth a hearty laugh even if it does cost the latter a painful month in the hospital and several trained nurses. And there is the pensive mule with a couple of active lightning bolts tacked on to each rear corner of his anatomy. He breaks his reverie long enough to fling out his pent up emotions and his victim lands in a corner with his bones broken or dented and the public looks on in high amusement with never a sigh for the poor human wreck.

And so it is with the Ford car; buy one and instead of calling forth the sympathy of your friends you become the butt of mirth. Break your arm cranking the thing and your friends *know* you own a flivver and show no sorrow.

We really think that Ford owners deserve help and we announce ourselves ready to render the assistance necessary. If you own one of those machines, if you ever expect to buy one, if you ever expect to ride in one, or if you dodge one, or if one runs you down, you should be interested in our April number. We can safely promise that you will read every word in it. We hope you will be amused, helped along your way, and instructed.

MAY 2 1922

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 16-22 Hudson Street - New York City

Entered as Second Class matter January 15, 1921, at the Post Office at Cooperstown, N. Y., under Act of March 3, 1897

Vol. 33, No. 2

APRIL, 1922

Monthly \$1.50 per Year
Single Copy 15 cents



A Friend in Need

Over a million motorists carry the simple Shaler Vulcanizer for emergency use in making quick, permanent tube repairs—at home or on the road. It is the greatest convenience ever invented for the motorist.

The Best Selling Accessory

Every demonstration makes a sale—because every motorist wants the Shaler 5 Minute Vulcanizer, just as soon as he sees how easy it is to make quick, permanent tube repairs with it. Every sale makes a steady customer for you, as every user will come back for extra Patch & Heat Units to use with his Shaler. Each sale brings a chain of sales on which you make a good profit every month in the year.

The Shaler has not only made vulcanizing simpler, and decidedly cheaper, but is automatic in action and so easy to use that any motorist can make perfect, heat vulcanized tube repairs with it, anywhere on the road, in 5 minutes. It saves time, prevents delays, makes tubes last longer. The Shaler makes a strong, durable, permanent tube repair that can't come off—stronger than the tube itself. It's easier than sticking on a temporary cold patch—quicker than changing tubes.

ALL JOBBERS SELL IT — WRITE FOR WINDOW DISPLAY

The Shaler, 5 Minute Vulcanizer also repairs rubbers, rubber boots, hot water bottles, rubber gloves, coats, etc.

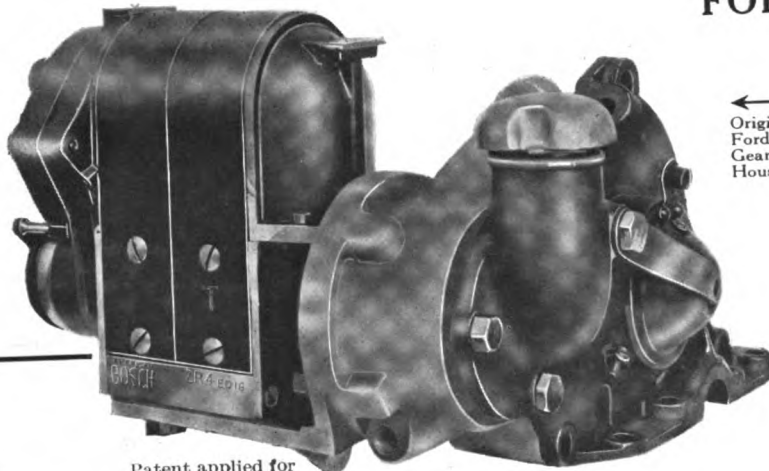
The Complete Outfit includes the vulcanizer and 12 Patch & Heat Units (6 round for punctures and 6 oblong for cuts) and retails for \$1.50—except west of the Rockies and in Canada. Extra Patch & Heat Units retail for 75 cents a dozen. Write now—for our new Window Display, Counter Display, Circulars and other Dealers' Sales Helps—Dealers Discounts, etc.

C. A. SHALER CO.
803 Fourth St., Waupun, Wisconsin



H PARKIN

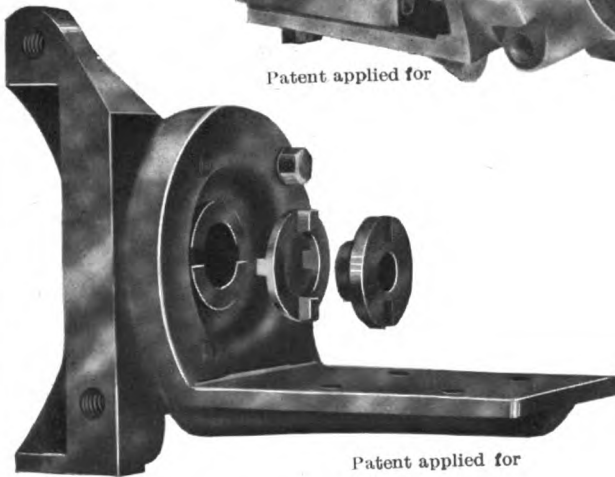
MAGNETO ATTACHMENT FOR FORD CARS



Original
Ford
Gear
Housing.

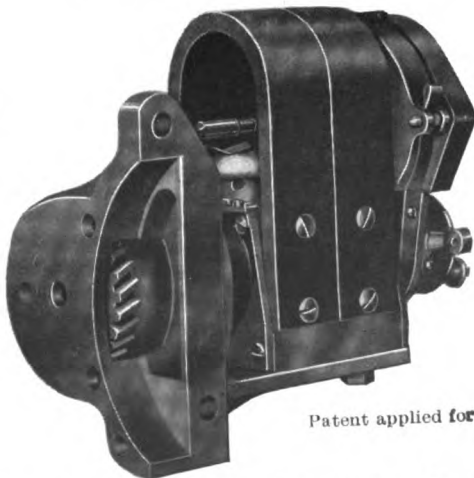
\$20.00
Complete

Patent applied for



Patent applied for

The Attachment



Patent applied for

Attachment with Magneto Seated

The exceeding Simplicity of the H Parkin Magneto Attachment makes it the choice of both dealer and car owner. It has but one gear which is in perfect pitch with the cam shaft gear. It has also only one bearing.

Because, when attached, it is integral with the cam shaft gear housing—it is lubricated direct from the engine crankcase which insures perfect lubrication without the need of extra attachments.

Because of its simplicity and the fact that there are no Ford parts to remove, it can be installed in 30 minutes.

The H Parkin is made of the finest materials. It is strong and durable. The gear is mounted on a hardened steel magneto driving shaft, which is rotated in a high speed bronze bearing and lubricated from the gear housing. Thus there are no oil cups or other oiling devices which might be neglected.

The magneto coupling is the Oldham joint type and perfectly fits all standard magneto shaft tapers. It is key seated and case hardened. It is always in perfect alignment—and subject to no great strain or wear.

Dealers, write for further details and discounts.

RENARD MOTOR SUPPLY CO.

Abbott Building

Philadelphia

Penna.

FULLY GUARANTEED

Automobile Dealer and Repairer

REGISTERED IN THE U. S. PATENT OFFICE

VOL. XXXIII. NO. 2

APRIL, 1922

PRICE { 15c per copy
\$1.50 per year

A Legend of the Flivver

SHOULD you ask me whence this flivver,
Whence this noisy, flimsy road-louse,
With its lack of paint and varnish
And its crazy, dented mud-guards,
With its curtains all in tatters
And its tires a mass of patches,
I should answer, I should tell you:
In the year of nineteen thirteen
When such things were yet a wonder
It was made out in Detroit
By the shining, big-sea water;
In the factory of Henry

Where they make them by the millions.

Over there, they make the engine,
Over here they build the chassis;
Here, the body's made and painted
There the steering gear and mud-
guards

And the product is created
At the rate of one each minute;
At the rate that P. T. Barnum
Claimed our gain in population.

This old cart is now a vet'ran;
Seen the snows of many winters,
Seen the heat of many summers
Seen the miles of many journeys,
Known abuse from many owners;
Still it runs upon the highway,
Still it earns its modest living;
While a million higher-priced
cars

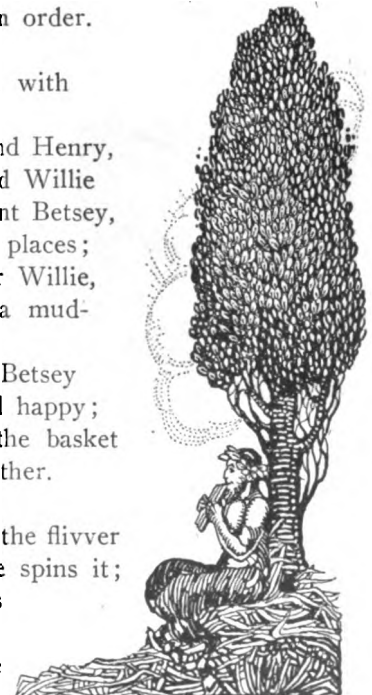
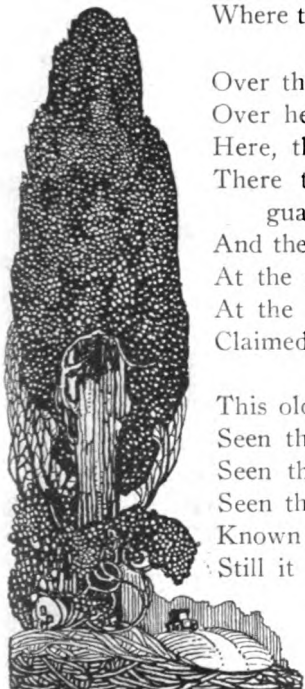
Have been scrapped into the junk heap.

Forth into the barn or wood-shed,
In the early hours of morning,
In the early Sunday morning,
Comes the owner, bent on travel.
First he pumps his tires and tests them
Then he fills the radiator;
Tries his oil and cleans his timer,
Fills the gas-tank, oils the bearings,
Pounds the wheels to knock the mud off,
Fusses 'round till called to breakfast,
When the house is put in order.

When a basket's packed with
luncheon
Dad and mother, John and Henry,
Sue and Peggy, Fred and Willie
Uncle Frank and old Aunt Betsey,
All pile in and take their places;
On the hood sits brother Willie,
Fred is tucked behind a mud-
guard;

In the lap of old Aunt Betsey
Sue is sitting, proud and happy;
On one step is lashed the basket
And the dog is on the other.

Dad gets out and cranks the flivver
First he lifts it, then he spins it;
By and by, with snorts
and splutters
And explosions in the



muffler

Off she starts and keeps on running.
Dad gets in and works the levers,



Makes her jazz and smoke
and rattle,
Puts his feet upon the pedals;
First he starts her, then he
backs her
Turns her 'round and then
on second
Out she goes upon the high-
way.

Down the street and o'er the crossing
Bucking, kicking, popping, snorting,
Down the cross streets, up the main street
To the road into the country,
To the green and fragrant country.
When she's warmed up she goes better
Better still as she goes further
Till she settles down to business,
Purrs and hums as though contented.
Fred asks Dad if he'll drive
faster,
Mother tells him to drive
slower;
Henry thinks the engine's
skipping,
Peggy says the brake-rods
rattle;
Uncle Frank and old Aunt
Betsey
Sit and smile and do no knocking.



Miles and miles along the highway
Runs the flivver without effort
Passing those who do not hurry,
Keeping up with all the others;
Till the hot and sultry noon-time
Till they reach a grove of pine-trees;
Dad then backs her down a cart path



Ma and Sue unpack the
basket,
Willie goes to get some water,
Dad spreads down the Sun-
day paper
While the others, cool and
happy
Sit around and wait for
luncheon.

By and by the lunch is eaten,
Dad is smoking, Mother's reading;
Willie's found a nest of hornets
And been stung upon the forehead;

And the dog, with John and Henry
Are down to the creek, in swimming;
Thus they pass the hours of leisure
'Till it's time for starting homeward.
Dad looks in the radiator
Says it leaks and needs more water;
Willie ducks behind a pine tree,
Fred is missing, John is hunting
For the dog who's chasing squirrels;
Henry growls but has to get it.
Says the others "don't do northern,"
Says they always call for Henry.
By and by they all get settled
All in their respective places;
After that there came the
cranking
Came the priming and the
spitting
Just the same as when they
started
In the early hours of
morning;
But at length, when this was over
Back they trundled to the city.



In the cooler hours of evening
Mother went out to the neighbor's,
Went out calling and returning.
Said that all the neighbors told her
It had been the hottest Sunday
They had known since eighteen-ninety;
Told of sweltering at noon-tide
Said they'd telephoned for ice cream
Said that Eppie Hogg, the fat one
Had to have the doctor to her.

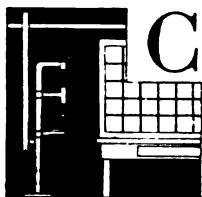
So they sat and blessed the flivver
For their cool and pleasant Sunday
And they blessed the name of Henry
And they said that, in the future
When they heard the funny stories
From the owners of high priced ones
They would grin and just say nothing.



Case Hardening of Steel

The Average Repairman Often Needs to Give Shafts and Bearing Surfaces a Hard Covering

By J. F. Springer



CASE-HARDENING consists of two distinct operations. (1) There is a treatment of the soft steel article with the purpose of creating a skin of high-carbon steel. (2) Then there is the operation of heating and suddenly quenching the article with the purpose of hardening the outside coat of high-carbon steel. Sometimes, perhaps, most of the time, the two operations are run into each other in the following way.

When the heating is carried out that is necessary for impregnating the outside skin with more carbon, the temperature is higher—a good deal higher in fact—than what is necessary in order to do the hardening. And so, a good many people take advantage of this heat and do the quenching at once. That is, the work is taken from the case-hardening furnace and put immediately into the water or oil. The idea here is to kill two birds with one stone.

But others do not proceed in this way. They take the work from the case-hardening furnace and allow it to cool to a black heat or lower, and then heat it up again for the purpose of getting the hardening temperature. When this point has been reached or a trifle higher, they put the work into the oil or water and accomplish the desired hardening.

These people do not try to kill two birds with one stone. They are more or less of the opinion that the two birds can not be killed with just the one stone; and that the second bird is only partially killed. In short, they make two distinct operations out of the whole job, and are of the opinion that this is the way to get the very best results.

I will not pause here to consider the question of which is better, but reserve this matter for a later moment. Just now, however, let us note that case-hardening is carried out in the industrial world in two ways.

Case-hardening requires that carbon shall be introduced into the steel. In fact, the outer skin is to be made over into a high-carbon steel; and this is done by injecting carbon from the outside. This is a fundamental fact. If the reader desires to make any headway in the knowledge and practice of case-hardening, he must thoroughly grasp this statement.

The difference between soft steels and tool steels consists essentially in the relative amount of carbon. I am not speaking now of alloy steels, but of the simple steels with which everybody is more or less acquainted. Steels contain all sorts of percentages of carbon from almost nothing on up to 2 per cent, say.

The amount of carbon may be changed gradually, so

that there will be thousands of steels between the two limits, each one containing just a trifle more carbon than the one before it. There is no known percentage of carbon that may not belong to a steel. Now the steels get harder and harder as more and more carbon is added. I am not now speaking of the hardness gotten by heating and dipping in water, but of the hardness naturally belonging to the metal.

We may divide the range of steel into two classes: tool steels and non-tool steels. In the former class we may put all steels that contain not less than 0.90 per cent of carbon. All these tool steels are not only fairly hard naturally; but they are capable of being made very hard by properly heating and chilling them. The non-tool steels are not so hard, naturally, as the tool steels; but they also lack the extreme hardness of the tool steels, when they are heated up and suddenly chilled. The less carbon, the softer they are and the more difficult to get any satisfactory hardness by heating and chilling. If we consider such a steel as that which contains only 0.10 per cent of carbon, we have something not especially different from wrought iron.

Now the case hardening process—particularly the earlier operation—has the duty of converting the soft steel of one class into the hard steel of the other. Only, it acts from the outside towards the interior, and it is not everybody, perhaps, who realizes that when the articles come from the furnace and before they are chilled, the outside shell consists of a high-carbon tool steel. But that is the truth of the matter. The interior from the center to perhaps 1/16 inch of the surface is still the original soft steel. When the chilling is done, this core of soft steel stays soft. The outside shell may now be a steel containing 1.25 or 1.50 per cent of carbon. When the heating and chilling are properly done, this outside shell will then become very hard and the interior remain quite soft.

Now, where is this extra carbon to come from? That is an important question. We must provide it, and we can not make any substitution. We may vary the form of the carbon that is supplied; but no extra heating or other maneuver will take the place of actual carbon. One of the usual procedures is to use *bone dust*. That is, the bones of animals are either granulated in the raw state or converted first into animal charcoal and then ground or pulverized to a convenient grade of powder.

This is perhaps the most usual of all substances employed in large shops. Potassium cyanide is another usual substance. This is used by very many shops where a quicker method is desired and no very great thickness of the outside shell is necessary. Perhaps the

simplest way to proceed is to melt *potassium cyanide* and immerse the iron or steel article. All these substances contain carbon. All supply carbon to the steel, and in that way convert it into high-carbon tool steel on the surface.

Experience has shown that there are quite a number of substances that may be employed. I list the following:

- Wood charcoal
- Leather charcoal
- Bone charcoal
- Raw bone
- Horn charcoal
- Potassium cyanide.

This may be regarded as a partial list.

The potassium cyanide is a very poisonous article. If used, it should be employed with intelligence and care.

Case-hardening may also be done without using any solid material at all. That is, there are several gases which are suitable. Naturally, such gases must contain carbon. Indeed, the reader must keep this big fact before him all the time. Carbon must be supplied; otherwise no high-carbon steel will be formed in the outer shell of the work.

In general, if the work is to have a *considerable thickness* of tool steel on the outside, potassium cyanide will not serve. That is, it is scarcely desirable to see whether it could be used to get a thick shell, as then it would probably have to be used in some more or less complicated way. But where only a thin—a very thin—skin of high-carbon steel is wanted, potassium cyanide may be employed.

Whether the same quality of job can be done as is possible with the other substances may be doubted. However, there is a good deal of work that can be satisfactorily accomplished with this substance. When this is the case, and the user is skillful and intelligent enough to avoid the poisonous effects, the potassium cyanide procedure is perhaps the easier and simplest of all.

With the other solid materials—as, for example, pulverized animal charcoal—the usual practice is to pack the article or articles in an iron or a steel box and then heat box, work and packing up to a fairly high heat and keep this heat up for a considerable time. The packing, under the influence of the heat, gives up carbon and this carbon—or some of it—penetrates into the high heated steel and thus combines with it in such a way as to form a new steel containing more carbon.

The penetration of the carbon into the metal is slow, very slow. Some very thick shells have been produced—that is shells of high-carbon steel. But, ordinarily, the shell will be only $1/64$, $1/32$ or perhaps $1/16$ inch thick. It takes time to get much thickness. This would not be so bad, if it were an easy job to keep the heat at an even level for a very long time.

For ordinary purposes, a shell of moderate thickness will be satisfactory—say, $1/64$ or $1/32$ inch thick.

It may be well to pause here, and consider what we propose to do with the shell when we get it. Naturally, we are going to harden this high-carbon, tool-steel shell

But what then? What service is expected? Frequently, perhaps generally, the ultimate object in case-hardening is to get a *wearing surface*. The article is not to be used as a cutting tool, perhaps; but it is to be employed to withstand the rubbing of other metal against it.

For example, when a screw thread is cut on a piece of moderately soft steel—say, steel containing 0.40 per cent carbon—then we have a thread that is not very stiff and which is liable to wear when the screw is screwed in and out. To provide against this wear and to give a degree of stiffness, the screw may be case-hardened. Usually, a very thin skin of high-carbon steel will suffice. The potassium-cyanide process may often be employed here, because of the fact that a very thin shell of great hardness will frequently be enough.

A gear wheel may require case-hardening, preparatory to going into use. Otherwise, the wear of its teeth against the teeth of its companion gear wheel may be considerable, especially if this companion wheel has a case-hardened surface. At any rate, there is to be a rub of tooth against tooth. A hard surface resists such wear. Here, a very thin surface excessively hard may seem enough for some cases; but for others, a thicker shell will be desired. That is, it may become necessary and desirable to have a shell thicker than can easily be provided with potassium cyanide.

Under these conditions, the method may be employed which proceeds by packing the article in pulverized solid material. Consider another case. A plain journal bearing may consist in part of a rod or spindle. As the spindle turns in the brass box or babbitt-metal box, it wears because of the friction, even though good lubrication has been provided. In many such cases, it would be highly advantageous if the spindle—or that part of it, at least, that turns in the bearing boxes—should be given a hardening treatment, since hardness resists wear.

Now, if the spindle itself had been made of high-carbon steel, it could be given a hardening throughout. That is, the whole spindle could be heated up to a proper point and then suddenly chilled. In this way hardness may be produced in a very satisfactory manner. But, frequently, the spindle will not consist of a solid piece of tool steel, but of a piece of comparatively soft metal.

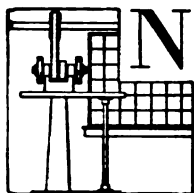
There are several reasons why the manufacturer may have preferred to make the spindle of the soft steel. In the first place, the manufacture of the spindle costs less, because the cutting operations on the lathe or other machine are usually easier with the soft steels. Second, the soft steel costs less money than a good tool steel, usually a good deal less. Finally, it may be a satisfactory material for a good part of the spindle, especially if the whole were put through a hardening process.

Hardened tool steel is usually more brittle than would be suitable for many articles. Consequently, the manufacturer made the spindle of a non-tool steel. By case-hardening the bearing surfaces of this spindle, one may get the wear-resisting qualities of a very high-carbon steel. If anything more than a thin skin of the high-carbon steel is wanted, use the packing method.

Ford Lubrication Troubles

With a Suggested Remedy for Many of the Ills
Which Beset the Owner of the Ford Automobile

By F. L. Almy



NO DOUBT every Ford car owner has experienced, at various times, lubrication trouble with his engine. Now by this statement we include those troubles which seemingly are caused by over-lubrication and which the owner quite naturally blames to the lubricating system, and, under this heading falls that bugaboo called carbon.

The Ford oiling system is simple, efficient and as near fool-proof as any system can be; that it does its duty too well is the only criticism which can be offered. If the system does not function properly, then the owner is usually at fault.

In order that we may understand the situation fully let us see first how the Ford oiling system functions. The main part of the system consists of a tube and a funnel. The tube runs along the right side of the engine, just below the cam shaft and ends just beneath the cam shaft timing gear. The upper end of the tube ends in a funnel which is located inside the flywheel housing.

Ford Lubricating System

While the engine is running the oil is lifted from the flywheel housing by the flywheel and magneto assembly and thrown into the funnel. From there the oil runs to the timing gear case, overflows to the oil pan beneath connecting rod number one; thence to trough number two; then three and back to the flywheel housing again.

The ends of the connecting rods dip into the troughs and splash the oil into a spray which finds its way into the cylinders, to the cams and to the transmission gears. The whole engine and transmission case is usually filled with an oil spray while the engine is running.

Since all of the oiling system is enclosed, there is no chance for dirt to cause trouble, unless the dirt is put in with the oil. So long as the funnel and tube is clear, then oil must feed to the front of the engine, if there is any oil in the flywheel housing.

Unfortunately, however, the construction of the transmission is such that the latter unit may be the source of constant trouble. Brake bands, around the transmission drums, will wear and the shreds or fibres will get into the oil. The flywheel will catch up the threads and sooner or later the oil funnel will become clogged. As soon as this happens the whole oiling system fails and great damage may result.

Such troubles may often be obviated by removing the old oil at the end of every 500 miles and replacing it with new. If examination shows that the brake bands

are fraying out, remove the oil immediately, strain it through cheese cloth, wash out the motor with kerosene and if the old oil is still good it may be then replaced.

But one seldom knows when the brake bands will start the trouble. Even a set of new bands may cause trouble inside of a few miles and one cannot take the time to clean the engine every few miles.

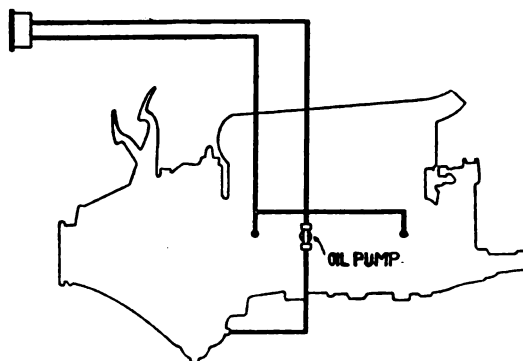
Not only is the system subject to troubles through lack of oil but when it functions properly it often works too well. Though too much oil is infinitely better than too little, it can cause considerable annoyance.

When the car is standing on level ground the system, if clean, is all that can be desired. We might even go as far as to say that it is as near perfect as any in existence. But put the car on an up grade, let it climb for a while and the front two cylinders may not be properly lubricated. (The oil tube does not carry enough oil to supply the pans if the engine is tipped so far that the oil is drained too rapidly.)

If, on the other hand, the car is running down hill for any length of time the third and second pans are soon drained and no oil gets to them until level ground is reached. (Except a certain amount of spray from the flywheel.)

Under such conditions it might be that one or two cylinders and connecting rods would be flooded with oil while the other one or two would be damaged through lack of oil.

In a previous number of this magazine we suggested



Diagrammatic Sketch of Suggested Lubricating System
Ford Engine

a method for changing the present oiling system by boring small holes in the Ford oiling tube, one hole above each connecting rod trough and partially closing the end. Although this scheme serves to supply each pan with oil, under all conditions, it fails when the oiling tube becomes clogged with lint and dirt.

We submit the following idea to our readers who care

to install a system which, though more complicated than the regular system, should be far more satisfactory than the regular one.

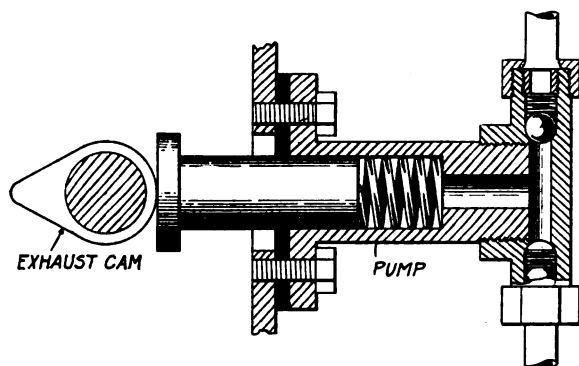
Either make or buy a small plunger pump of the type commonly used on some of the smaller cars for pressure oil feed. The pump used on the Model D Chevrolet or Model 34 Briscoe is a good example. This type of pump consists of a plunger, shaped much like the ordinary tappet in the Ford engine; a coil spring to return the plunger; a flanged body and two check valves.

The Pump Mounting

In ordinary practice these pumps are mounted on the outside of the crank case in such a way that the plunger works against one of the cams on the cam shaft. The cam presses the plunger in and forces the oil through a ball check valve to a sight feed oiler on the dash. A pipe from the dash feed carries the oil to the engine.

Such a pump guarantees a constant circulation of oil, from and to such points as desired. The idea with the Ford engine is to insure a supply of oil to each connecting rod pan under all conditions, up hill and down, regardless of dirt or angle of driving.

In applying such a pump to the Ford engine it is first



Sectional View of Pump for Ford Oiling System Showing Relative Position on Crankcase Near Cam

necessary to drill a hole in the crank case, just beside one of the cams. This may be done by locating the center of the cam shaft and marking a center line along the outside of the case. Measure the distance to the center of cam number seven or eight, (fourth cylinder intake or exhaust) and then boring at this point. The hole should be just large enough to take in the head of the pump plunger.

The pump may then be held in place by cap screws. The lower or intake end of the pump must be connected with the lowest part of the flywheel housing. But in order that there be no chance for clogging of this pump some sort of a strainer should be provided.

The Oil Strainer

The proper strainer should be made from fine brass gauze and connected with the housing through a $\frac{1}{4}$ inch brass nipple. The connection may be made with the lowest petcock at the back of the housing, but it is better to connect it at the front as shown in the illustration. First the $\frac{1}{4}$ inch nipple, then the strainer and finally

the tube leading to the oil pump. (Another short article in this issue shows how a cheap oil or gasoline strainer may be made.)

From the pump a tube leads to the sight indicator on the dash. This indicator should not be of the pressure type but of the "flow" type. Such an indicator is nothing more than a short length of glass tube through which the oil must pass.

From the indicator the oil goes to two connections on the side of the crankcase. One connection is directly above the connecting rod pan for the second cylinder, the other directly over the third cylinder pan. By this scheme every pan is supplied directly, except number one. But since the old oiling system is left in the car, number one cylinder will probably be supplied with lubricant under all conditions. At any rate the new pump will supply enough oil so that the splash from number two pan will supply number one cylinder even though the regular system fails entirely.

Not only does this system seem to insure a supply of lubricant at all times, but it also acts an important role in connection with the old system for by its very action it tends to suck into the strainer those pieces of lint or dirt which normally would fall to the bottom of the flywheel housing and thus dispose of them before they might clog the old feed pipe.

True, such pieces of lint might clog the new system also, but the sight feed on the dash will indicate this fact immediately and it is a very easy matter to remove the bottom of the strainer and clean it out.

Heads That are Ornamental as Well as Useful

NEARLY all of us glance in at the open door of the fire house as we walk by. The big machines and the polished metal and the picturesqueness of the life attract young and old. One of the things that is admired greatly is the beautifully mottled, shining heads of the chemical tanks. Now, these tanks are supplied with plain smooth heads, if the purchaser so desires, but as a rule the "pebbled" heads are ordered for, besides being handsomer, they are stronger.

The highly polished indentations look as if they were machine made, so regularly are they formed. But they are not. A thick disc of copper is first pressed to the cup shape and then it goes to the pebbler, a workman who sits before a metal post or anvil which has a dome shaped upper end corresponding with the pressed shape of the disc. The workman's only tool is a special heavy pein hammer and he produces each pebble with a single blow of this hammer. He doesn't even lay out a design—it calls for skill and long practice—there is no salvage for a head with a single mis-blow and it goes to be melted over. The hammering makes the metal more dense and the ridges formed become diminutive stiffeners all over the head, making the unusual combination of usefulness and beauty.

A Mis-Used Chauffeur's Diary

In Which the Disgusted Gentleman Tells of the Troubles Which Go to Make a Week's Trial

By Dale R. Van Horn



MAY 7: Answered a ad in the morning paper which read as per follows: "Wanted a chaffeur. Must know how to run an automobile." Went out to the address and found the place, near three weeds $\frac{1}{2}$ mile from annywheres.

Mrs. (Smith) was to home. She said

Mr. (Smith) was out in the garage. The "garage" was nothing but a woodshed and if it had of been born on Elm Street in my home town it wouldn't of looked a cross-eyed calf in the face. Mr. (Smith) was putting concrete on the floor. I says Good morning sir, I was out answering a ad wich I saw in the paper this morning. I thought this must be the place, but I'll be going on. Can you tell me if—

I run that ad says he and your'e hired. I told Mrs. (Smith) I'd be darned if I'd hire no chaffer and she says I would and I says I wouldn't and she says I would or she'd tell the cops about my still in the basement and I says if fifty guys answer that ad I'll hire the fiftieth one. If they's any less I won't. Forty-nine have just left. And if she spills anything about those copper tubes in the cellar she can wave good-bye to me.

Its too far from town to see a show. Guess I'll turn in. Hope the roosters don't start too early. I haven't seen the car and don't know how much I'm going to get. They's something strange here. The Mrs. and Mr. (Smith) are sore at each other. Hope the lady is a good cook. She ought to have some good point and I haven't seen it yet. Gee!

May 8: Woke up at six o'clock. Thought it was the fire alarm. It was the alarm clock in the next room. They must of bedded it down under a tin pan. Good breakfast. Mr. (Smith) says I should go down town with him to get the car. Mrs. (Smith) says now henry don't lose any of that \$900. I says er I would kinda like to know what my salery was going to be.

Well, we had better fix that up, he says. How would \$90. And keeps, I says And keeps says he. I says, well, I had ought to have a hundred but if you will hang a cup for me next to yours down there in the basement, it might be all right. He rubbed his chin for a second and then he says he guesses that will be all right for he don't want to pay much over \$350 a month for help. A good healthy sneeze from the cat would have raised me. He ment ninety bucks a WEEK! And me runnin ragged looking for a two-bucks-a-day job. The sky is clearing.

We walked ten or twelve blocks and boarded a street car down town. I did some deep thinking. I couldn't dope it out. Two people like Mr. and Mrs. (Smith) living in a cheap house, keeping chickens and second rate neighbors and then paying a guy ninety a week to run a car. There must be more. Already I had earned about seven dollars and fifty cents and Mr. (Smith) paid the carfare so I should worry. But I would look funny in a chaffers outfit driving a nine hundred buck car, now wouldn't I.

We got off the car in the loop and a big blue Neptune sailed by nearly sinking both of us. That is the kind I think she got, Mr. (Smith) said. I says who got what? Mr. (Smith) says I believe Emma picked out that kind that just went by. I says wy, Mr. (Smith) that was a Neptune and they cost without extries of any kind about eight thousand. I know 'cause I once knew a fellow who drove one. Yes, it must of been a Neptune, says Mr. (Smith) because Emma paid the man \$8700 yesterday, like he was recalling a bad poker party. I grabbed a lamp post and didn't go down. What are you getting with the nine hundred Mr. (Smith) I managed to ask. He stepped aside to let a Boston Bull go by and says, oh Emma wanted the upholstery changed. They said it would be ready this morning. Sufferin horseflesh I thought, ain't nature wonderful.

We gets to headquarters where I loses no time hunting up Jimmy Connor one of the salesmen who I know a little. What in the name of mud, I says, is going to happen next? I told him how I answered the ad and how the surprises were coming regular. He luffed. O, that ain't nothing, he says. You'll quit just as fast as you started. I don't know much about it but both of them come in here yesterday, or rather, she come in dragging him and she says she is going to buy a Neptune. We all thought they was nuts and while one of us stalled them off awhile I goes in and phones the credit bureau. Their rating is O. K. but darned limited. He never made two thousand a year in his life and he sells shoes down here in a little store.

Then I goes back and tells them we are sorry but the last car on the floor is sold and we don't expect any more until harvest. The lady was indignant and she says she had made up her mind to buy nothing but a Neptune. But, kind lady, says I, do you know what these babies come at? I figured she would say, oh about \$475. She didn't. She says, Yes, I saw them advertized in the last Sunday Liar and they is \$8700. So I brought that much along with sixty cents more for gas, which I figured ought to take us home. And she had the coin.

We all took one peep for it ain't often any of them come in and wave that much money around, and decided that the one over in the corner wasn't sold after all. The sale was made, then she wanted the upholstery taken out because she said she preferred cloth—a grey stripe—to green leather. We told her that would be \$900 and she said it would be sent down today. The poor old dear, she could have bought covers for the seats for about forty-five bucks.

Then I asks Jimmy some questions as to how the darned thing worked. It was a right hand drive and I had never set in one let alone taking her out in crowded traffic. It was my move to tank up on some eleventh hour knowledge. Mr. (Smith) was waiting when I came out and we drove away. It didn't take me long to get into a quiet street, I'll tell you, and the seat was so low and the side of the car so high that I couldn't tell how far I was missing cars we met. I was so darned afraid of katching some hub that I kept climbing the right hand curb all the way home.

Mr. (Smith) didn't know a stilsen wrench from a cam shaft but he kept monkeying around with the things in front and its a wonder we got home at all. He found the cutout someway and stepped on it while I wasn't looking and it made such a roar that I jumped about three feet and come down on the gear shift lever. They was six or seven cats got across in front of us and all but one was black. Its a good thing I don't believe in signs.

We got home a little while ago all O. K. It went into the woodshed all right but about six hundred pounds of the rear hang outside. Mrs. (Smith) says we will have to tear down the scratching shed and lengthen the "garage" out. Garage me eye. This is a soft job, though and the eats are plentiful. I am to break Neptune to be gentle tomorrow. Wonder if I get paid every week or twice a month. I should worry if the money's good.

May 9: This has been a long day. I had a good breakfast then I told them I was going to take her out and warm her up. I said though I had run four or five Neptunes it had been several months since the last one and I was out of practice. I sure was. What I wanted to do was to get her off in the woods alone and learn something about her. We got to the woods all right and I started in. Time flowed along pretty fast.

I had just turned page 98 and was on the last chart when two danged officers rode up on two wheels apiece and said I was arrested for car stealing. I couldn't lie, neither could I explain to them birds so I had to drive back with one ahead and the other in the rear and I would have gone to the cooler in spite of flaxseed poultices if it hadn't been for Mrs. (Smith) who said she had to have me drive her down town tomorrow. And neither Mr. or Mrs. (Smith) believed me until tonight when Mr. (Smith) and I went down cellar and communed in the shade of the coiled pipes. When he was two sheets in the wind he apologized and said he under-

stood how it was. Alls well that ends well. I got kind of a stew on myself. Its started to rain.

May 10: Rained all day. I spent two hours this morning fixing old umbrellas up over the part of the car that wasn't inside. They leak some but the water doesn't seem to do much damage. It sure makes a pretty sight from the road. I'll bet the neighbors are having some good laughs. The dogs which has been sleeping in the woodshed all left. The sparrows still bother though. Tomorrow I have got to sneak the scratching shed away from the leghorns and revamp it into a three foot addition for the "garage."

I have a new job. I have to tend still and keep the copper polished bright. Had an explosion down there last night. The safety valve didn't work and it blew a handful of raisins through one of the basement windows, breaking every glass. I'll have to put them in tomorrow, too. Three more days till pay day. 90 bucks. Goodness me. Still raining.

May 11: Went to the filling station this morning and got three gallons of gas. The tank holds twenty. Mrs. (Smith) said three would be ample for awhile. One gallon is seven miles. Gave me my new outfit. Looks all right from a distance of a few miles but the blamed stuff is cheap. I look like a clipped Santa in it. Hope I never run across any of my friends while on duty. Tomorrow is Sunday and I think we are going somewhere because she told Mr. (Smith) to get some sen-sen and a shine.

Then I saw a dressmaker come this afternoon, or somebody that looked like one and go away without the three boxes she brought. I'll bet its pink. Pink looks lovely on a two hundred pound wo-lady. I am some carpenter. The guy that built the scratching shed clinched every nail. I broke two hammer handles and skinned six knuckles and only saved about fourteen boards out of the lot. They weren't long enough to do much good so somebody is coming Monday that can drive nails. Hope he gets the garage long enough. The home brew is getting stormy. Ho-hum. Good night.

May 13: Suffering mud turtles! What aneluvlife! Mr. (Smith) is out in the chicken yard cussin and Mrs. (Smith) is laid out on the sofa in the living room, with a headache. So she says and I won't argue. I know if mine had gone through the top of the car it would ache, too. As it was, it only went through the windshield. But the little jaunt certainly chewed up my two ears. One looks like a gored beet and the other like a strip of sun-dried bacon. Only you can't see them because they are hid under sixty yards of cloth.

They said it was all my fault. But how in the name of little kittens did I know that fourth lever down front was an electric emergency brake. I hadn't tried the cut-out yet, but supposed all along that was the cutout.

I suppose I might as well put it down. Yesterday morning we started out for Hillville a little town about

forty miles from here. I guess it was the home town for the (Smiths) and she wanted to go home in style and show off. Which she did. I had a swell time and was kept busy taking the old boat out and driving places.

I went to a swell dance last night wich was go-getter—a regular rollicking Judas. All the people there were well to do and finally several men got me off in a corner and asked me how the Smiths had made so much money. I was game and said they had made it by hard work and taking a gambling proposition when it came along. I mentioned the fact that they owned a five story cottage on Lake Michigan and had a garage as big as the town hall.

We left the town this noon in a blaze of glory. Gosh. I got a real thrill piloting that machine out of the town square and heading her for home. It was clouding up some and soon began to sprinkle.

The asphalt was slicker than it looked and as we neared a turn I stepped on the gosh-blamed lever which I had no business of. The rear wheels locked and we spun around and nosed down over a devil of a steep bank and landed in a ditch all grown over with raspberries and grape vines. The Mr. (Smith) was frantic and kept taking little swigs from what he had left on his hip. He didn't offer me none. Pretty soon a car come along and picked us up and when I got home I phoned the wrecking company to go out and see what it could find. I'll bet my easy job is over. Well, I'm going down stairs to see about my pay, and then turn in.

May 14th: Suffering cats tails! It is four o'clock and I'm back in the lobby of the Fireside Hotel where I used to spend a lot of time. My job's gone and my ears are swelled biggern early ohics. Last night I told the boss I wanted my pay and he handed over \$5.60 which he said was all he had. Then the Mrs. (Smith) went upstairs and came back with a fifty dollar bill which she says is all she has. Gee, I was sore. I told them I'd sue and everything but I soon cooled off and figured that fifty-five chips was not so bad for one week. Then they tells me I'm no longer needed as they is taking their time about straightening the car mess out.

I guess yes! I didn't know what was really up till this noon when it come out in the papers. It seems that about ten days ago Mrs. (Smith) gets a letter addressed to her which contains a little yellow draft for ten thousand iron men. Both of them knew it wasn't theirs but by talking steady most of one day and going without their dinner they was able to convince one another it would be all right to use it to buy a car. It seemed that the life-time ambition of the Mrs. (Smith) was just around the lilac bush. She had had lots of practice handling him and didn't have any trouble this time. So they got the bus, hired me, and must of had several dollars left for gas.

I don't know what they was going to do about a possible blowout for one of them tires rings the bell at ninety bucks, even. And this smashup come along and if it hadn't been for an over ambitious auto insurance sales-

man who sold Mrs. (Smith) a ten thousand dollar policy the afternoon she planked down the 8700 they would of been in for keeps. And this letter was simple after all.

"They used to be somebody in that neighborhood with the same name and initials and everything and this draft was a legacy which come along for the original party when an aunt or something shuffled off for good. Mr. and Mrs. (Smith) are down to the station now, awaiting for developments and the hard heart of the judge to soften. I hope they get out all right.

ONE REASON WHY TIRES WEAR OUT

By W. F. Schaphorst*



HERE would be absolutely no wear on an automobile tire if the tire ran on a perfectly smooth road. Fortunately, though, no such road exists. Unfortunately, as far as tire wear is concerned, rough roads *do* exist.

Any road, to be of any value at all, must exert a frictional force on the tire. No automobile could run on a frictionless or "perfectly smooth" road. In order to have tractive force we must have friction, and with friction we always have wear.

These things being true we must therefore conclude

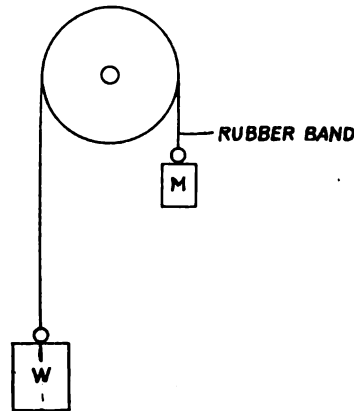


Diagram Illustrating the Experiment Anyone May Perform To Show Why a Tire Wears Out

that there will always be wear on a tire no matter how smooth the roads may be made. The smoother, of course, the less the wear, but that is as much as we can say about it.

Again, no matter how much friction exists between the tire and the road there always is some slip. Properly, this kind of slip isn't slip at all but should be called "creep." It is unavoidable.

To illustrate, here is a simple way in which you can prove to your own satisfaction that creep exists and that it isn't slip: Hang a weight *W* at the end of a rubber band and another slightly lighter weight *M* at the other end. Support the two over an ordinary spool as shown in the sketch, running a lead pencil through the opening through the spool. You can now rotate the spool easily one

way or the other and as the spool rotates the weights will move up or down, depending upon the direction of rotation of the spool. Keep up the rotation back and forth, however, and it will soon be noticed that a point on the rubber band doesn't always come back and coincide with the same point on the spool as would be the case if the weights W and M were equal. The weight W, being heavier, causes the rubber band to gradually move in its direction. This movement is called "creep."

The same is true in the case of an automobile tire. There is a gradual "creep" in the direction of motion of the tires. This holds true for the rear tires only. Front tires do not creep at all because they do not transmit power.

Creep has the same effect as slip in causing wear on the tires but although it is so small that it is impossible to detect it with the naked eye, nevertheless it exists. In

going a mile, for example, the rear tires may rotate 606 times where as the front tires of the same diameter will rotate only 600 times. There are therefore 6 extra rotations of the rear tires due entirely to creep. These rotations are absolutely *lost* as far as distance and power are concerned and besides they produce much of the excess wear suffered so much by rear tires.

Horse power loss is directly proportional to the creep. Thus if a rear wheel makes 100 revolutions whereas it would make only 99 if "pushed" along as are the front tires, the power loss due to creep is one per cent or 99 subtracted from 100 and divided by 100.

This will probably help toward explaining why the rear tires are the ones that suffer. It isn't due to slip alone nor so much to heavier load. One of the big reasons is—"creep."

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Nuggets of Automotive Wisdom

Hints, Suggestions, Facts and Helpful Information Gathered by An Expert for Your Aid

"IS IT possible to get a car in two gears at the same time?" Yes, this is a serious question. A good many drivers have found themselves in this predicament, didn't know how they got there and didn't know what was the reason the car wouldn't start.

It all comes about through the H-shaped shift lever quadrant and the selective type of transmission. There are two forks that move two sets of sliding gears, in either of which forks the shift lever may be placed at the center of the H, or the gate.

Now, suppose the car has been stopped without moving the lever to neutral first. Later, the driver does move the lever to neutral but when the weight of the car is still on the gears, they resist sliding so much that the lever can be pushed into neutral without entirely disengaging the gears. Then, when the driver is ready to start he moves to low or reverse and engages those gears readily if the teeth happen to line up. The transmission is then locked on itself and the car cannot be moved, though the engine can be started if the clutch is disengaged.

Only when conditions are favorable can this be done—and that is why the trouble is not more frequent. In the first place, the car must be stopped with gears in and the weight (as on a grade) creating friction in all the driving members from wheels to engine. There must be more or less looseness in the gear shifting parts so as to enable the lever to get into neutral without pulling the rod with it. The gears for low or reverse must happen to line up. And the driver must be careless or flustered.

When two gears are thus engaged, and it appears impossible to get out of the last one, stand on the running board and jounce up and down, joggle the car by pushing

and pulling as far as it will go, or jack up one rear wheel. If the lever does not slide out of itself with these jarrings, have some one push on it during the process. It is not a serious matter but those who practice it usually take some conspicuous spot for the performance, to the enjoyment of their friends.

* * *

MY neighbor, Doctor Barnes, does not follow the crowd; he likes to be different. The celluloid "lights" in the rear of his car top had become scratched up and dim, as do all of their kind. It got so bad he couldn't see behind. He went to various top men and they all told him the same tale—it was a big job to put new lights in, he would have to leave the car and the top would have to be taken off entirely and, oh, it was a big job anyway you looked at it.

So Doc studied. Finally he and his good wife put in new glasses—and it looks like a \$20 job, too. It cost sixty-four cents and a little of their time and they got five dollars worth of pleasure out of it. The window space in that Jack Rabbit top is 10 inches by 24 inches, divided into four sections by inch-wide vertical strips of mohair. After the old celluloid was turn out, Mrs. B. ripped the stitching in part and cut entirely across the center strip.

Two panes of first grade window glass 10 inches by twelve inches had been secured and had all the edges thoroughly rounded. Each was to fill two sections. They were slipped in at the center, one to the right and one to the left, between the two piles of the top material. Sewing up the severed middle strip was an easy task

for friend wife who also made other deft passes with the needle to improve the job and the top generally.

These glasses are far superior to celluloid—clear to look through and superior in appearance—and after months of service they prove that they are well adapted to a mohair top. Car owners who have puzzled as to what was the best thing to do with that part of their tops might follow this example to their advantage.

* * *

IF YOU'RE going to buy a second hand car from the owner himself—here's a tip that may save you dollars. Cultivate the acquaintance of some boys in the owner's neighborhood. Kids are car-wise these days and they can tell better than their fathers what kind of shape a nearby car is in and what repairs are being made on it.

For instance, one ten-year-old let out that Mat Burr was always tinkering on that Reo of his and another volunteered that "Gus Schweitzer had a nice looking car but what's he been grinding cork for every night this week?" Both cars were offered for sale and both were (outwardly) in a nearly new condition; however the buyer of the Reo would get an engine ready to fall apart and Schweitzer's victim would not realize that cork had been stuffed into transmission and differential to quiet their noises during the demonstration.

* * *

HEREIN is proffered a suggestion for auto supply stores. When thousands of dollars are tied up in tires, hundreds in seasonable goods with only a limited sale, why not put in a hundred dollars worth of mechanics' tools? Such as—expansion reamers from one-quarter inch to three-quarters, bolt and tap extractors, taps up to one inch, both U. S. and S. A. E. standard, a couple of micrometers, S. A. E. dies up to one inch, and extra left hand dies of this standard from five-sixteenths inch to one-half inch.

These are essentially automobile tools, at times vitally necessary. Labor savers to garage men and men who repair their own. Even large, well stocked hardware stores seldom have this line but it is certain that any store that did have them, and let it be known through advertising and otherwise, would not find it dead stock.

Expansion reamers are particularly valuable for wrist pin work, taps and dies speak for themselves, bolt extractors save lots of time. There are very few machine shops that have a full set of S. A. E. threading tools—and garages are in the same state; the left hand dies will be used almost every day on brake rods that have broken off at the turnbuckles. And if the clerk himself were to use a micrometer in checking up a set of oversize wrist pins, he would shame the mechanic who came to buy and didn't own this necessary instrument.

IHAD had the opportunity to observe how quietly some of the Rollspiercemobiles ran after extraordinary mileage performances and I asked the executive in charge of the metropolitan service station how he accounted for it. He parried with, "Whose cars have you seen?"

When I named three of them, he replied, "It happens that each of those men is a careful driver or employs a careful, intelligent man. When we are positive as to the handling a car will get, we fit the pistons very close in the cylinders, allowing only 0.001" clearance. That seems to be the secret of the quiet engine long after the car has traveled enough to circle the globe several times."

* * *

GARAGE men, don't try to put anything over on the tourist! An instance is recorded of a quiet appearing man who drew up in a roadster and reported that he wanted the rattle fixed while he dropped in to see an acquaintance in the next block. On his return he was charged \$4, and went his way. Later he discovered that the "mechanic" had merely let his tires down to 35 lbs. It turned out that the quiet appearing man was not a tourist but was opening up the territory for a big house whose men now make semi-weekly trips the year around.

And the tourist may have influential friends in town. As witness the case of a Ford owner (plainly from the country) who had to be towed in and ultimately had to have master gear and pinion replaced. On the bill appeared an item of \$42 for the "special" pinion and gear, which the garage man explained that he "just happened to have by luck" for that size of Ford. The bill was paid without protest but the country gentleman showed it to his son in town. The latter knew something about cars and visited the garage the following Sunday; standing six foot four, and built in proportion, he demanded "\$30 back or I'll take it out of your hide."

* * *

ONE of the meanest things encountered by owners and garage workmen is the damaged special thread. No taps or dies are available in a thousand miles—the part may be a gear case or the engine or a rear axle housing, that would require a day's work to take out so it could be put in a lathe for re-threading—and maybe it would be almost impossible to thread it if it were in a lathe because the thread is located so deep in; that workable tools will not reach it.

The "tap screw" and "die nut" offer two ways out of the trouble. Either of these may be made of tool steel (preferably) or out of soft steel case-hardened.

The damaged tapped hole is usually deep down in the casing and for convenience, if for no other reason, the tap screw is made on the end of a bar. Later, the threaded end may be cut off, thrown away, and almost the whole of the bar used for other purposes. The end of this bar is threaded, cutting the same number of

threads per inch and making a very smooth thread of as near the size of the hole as possible.

Make the end of the bar tapered slightly, as a tap is tapered toward the point—the piece then enters the hole, "catches the thread" already there, and the full thread following cleans out the damaged section.

But before using, one or more notches are filed longitudinally in the end, making it something like a tap, forming cutting edges and space for chips. Even a crude job will help and two hours spent on the "tap" may save twenty on the floor. It sometimes happens that a bolt has to be made for the location being considered and in that case it is possible to make the "tap" with a head on it and have it answer both for tap and bolt.

The damaged male thread is apt to be on a large diameter such as housing parts or the thread on the end of axle tubes for the retaining nuts. The one best fix for this trouble is a three-square file in the hands of a skilled machinist. This treatment is recommended in all cases.

But some mechanics would make a better job without the file and there are instances where some tool to chase over the threads will make a nice job. The die nut will do the deed; it is merely a nut with smooth threads and having notches filed in to form cutting teeth and provide chip space. An old gear is as good a "blank" as could be wished for the die nut. Softened, threaded, notched, and re-hardened it has many of the qualities of a store-bought die and should chase all ordinary damaged threads into good shape.

* * *

SOUTHERN hospitality has nothing on that extended in Walden, N. Y., the greatest pocket knife town in the country. Our car stood along the curb on a side street for three hours while we transacted some business. Meanwhile, the left rear tire quietly blew out—we knew the shoe was a bit weak and had expected a blowout for the last hundred miles.

But imagine our surprise, on coming back to the car about noon, to find a jack under the rear axle. Yes, it was our own jack that some kind soul had fished out of the tool box and had raised up under the axle. Walden produces other good things besides pocket knives.

* * *

THERE is one sort of cylinder wear that the writer cannot account for. It is wear of the diameter—larger in the fore and aft direction. Anyone can see why a cylinder wears on the sides, especially on the right side as it gets the angular reaction from the explosion thrust on the crank. But why a cylinder gets wider from front to back is a mystery.

Single cases would indicate a bent rod or a crooked crankshaft or the crankshaft positioned too far one way or the other but it has happened that fully half the cylinders the writer sees are out of round in this direction.

indicating that it is something more than occasional misfitting.

Not long ago there were two new Paige cars that fouled the plugs with oil very badly—several sets of rings had been put in each in an effort to stop the trouble; on measuring the bores, they were found to be from .002" to .0025" out of round and larger from front to back. And almost daily we see Hudsons and Lexingtons which are worn from .003" to .006" bigger that way than across.

* * *

AT THE last N. Y. Show, we were admiring a popular Six that has become a leader in the field. We could afford to own one, if the spirit moved and we were sufficiently certain that the car would stand up in our hilly home region. Real information was what we were after.

Timidly addressing one of those tall, grand languorous salesmen ("lounge lizards" they are called in another walk of life), we asked a few humble questions such as the maximum speed of the car, its gear ratio, the most economical engine speed, approximate mileage to be expected on level roads, etc., etc. The composite answer to these humble questions is, "Really my boy, those are engineering questions and they have nothing whatever to do with the enjoyment of a Slicker Six. You can get any speed you want from that car, and do it easier than with any other car at the show, so why bother your head about unimportant matters. Our engineer is here somewhere—he might be willing to tell you—oh, no, he's gone out to lunch now."

Passing on through the crowd, our thoughts centered on "salesmen" and the sales they couldn't make and the public that really touches the manufacturer only through salesmen and the fact that manufacturers had cut their prices to the bone in a fruitless effort to sell cars to a public that all the time has money to spend.

* * *

EVERYONE knows what a lathe chuck is and how useful they are on repair work—half of automobile repair work requires the use of a chuck. And they are rather expensive, costing from one dollar to two dollars per inch of diameter, so I was rather surprised to see a nice 12-inch chuck on the little foot power lathe in the garage of a friend whom I knew didn't have any too much money.

He anticipated my thought and explained that it had been sold to him for a dollar at a machine shop where some carelessness had actually cracked the chuck body in two, rendering it "beyond repair." But he had taken it to a blacksmith who shrunk an iron band around the outside making it as good as new and at a total cost of three dollars for a splendid big chuck.

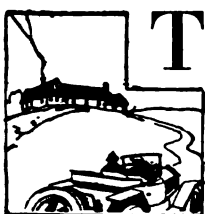
This man had just finished turning off his brake drums, something that too few car owners know about. When brake lining gets worn down, the copper rivets

touch the drum, scoring the latter in time in spite of the relative softness of copper. Then when new linings are put on, they are quickly worn out by the ridges of

the drum. If the drums are taken off, it is the work of but an hour a piece to machine the surfaces smooth which gives the linings a full bearing clear across.

Renovating The Ford Engine

Making the Ford Engine Equal to New is
Only a Matter of Proper Tool Equipment



THE biggest question of vexation to the Ford car owner of to-day and, to a certain extent to other car owners, is, "why cannot I have my car overhauled and put into condition just as good as when it left the factory?" The question is a reasonable one, in fact reason would

show that an overhauled car should be in better condition, mechanically than when it left the factory originally.

A new car, especially a Ford, is a machine made product, assembled from inter-changeable parts. Gears, studs, shafts and castings are made in various parts of the plant. Production is on such a large scale that all of the parts of the same kind, are essentially the same. The parts are produced in quantities and carefully inspected for errors in machining. Normally an error of a few thousandths is sufficient to render the part useless and it is condemned.

The assembling of these parts into a finished car is really a mechanical job for actual skill is seldom used. Hand scraping, filing or fitting are seldom resorted to.

Under these conditions the assembled machine, when new, is "green" or "stiff" and it will take hundreds of miles of running before the mechanism will work smoothly.

It follows, then, that a used car might easily be superior to a new one. Certain parts wear together and if the owner gives his car the proper care these parts will work smoothly and efficiently as long as the car lasts.

Engine and transmission parts subject to strains of driving, will, however, wear apart instead of together and after a time require repairing. And hence the question brought up in our first paragraph. If new parts are put

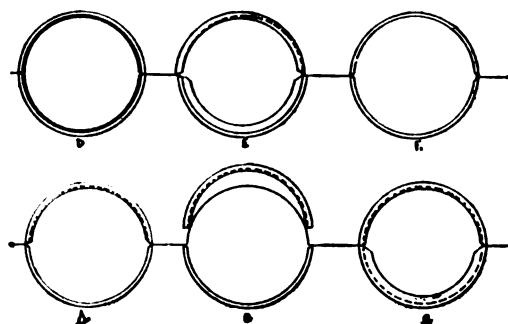


Figure 5

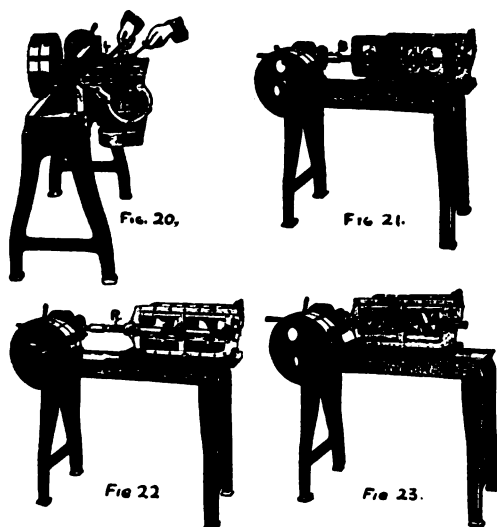
into the places of the worn ones it would seem that the engine would be made new again. But this seldom is true because the repairman's work and his hand fitting cannot be compared with the work of a machine which may be set to do a job mechanically perfect within an infinitesimal part of an inch.

By the courtesy of Mr. K. R. Wilson of 10-16 Lock Street, Buffalo, N. Y. we are able to pass along information of great value to those who are interested in making used Ford cars better than new. Mr. Wilson has made a study of manufacturing methods and as a result has perfected a number of comparatively inexpensive repair tools. It is by his kindness that we publish this article for which he has furnished the data and illustrations. This article will answer the vexing question and tell our readers how to overhaul a Ford engine and put it into the "new" class again.

The repair of primal importance is the replacement of the main bearings. Old babbitt bearings are impregnated with grit and metal, for that is the purpose of the soft babbitt metal to catch sharp particles and prevent scratching.

If the bearings are simply tightened there is danger that the grit will sooner or later score the journals. Ford babbitt metal contains 86% tin, 7% copper and 7% antimony. To pour it it should be heated to at least 800 degrees. At this temperature the tin will form a scum and if skimmed off will result in the lowering of the tin content.

Figure 20 shows a Ford block being re-babbitted, a regular babbitting jig being used for the purpose. With



Figures 20, 21, 22 & 23

the new babbitt in place the three bearings, with caps and shims in place, should be put into the machine and bored almost to the size desired.

Now it is not advisable to bore the hole to fit the shaft; in fact it may safely be said that an accurate boring job, as such, is impossible. The cutter on the boring bar soon loses its keen edge and naturally the size of the hole diminishes. Each hole, then will be smaller than the previous one, by a very small fraction of an inch.

Babbitt Density Varies

A second fact which leads to inaccuracy in boring is the variance of the babbitt density. The bar will cut through the softer parts of the metal but tend to "ride" somewhat as it encounters the harder parts. And so the boring operation should be considered as a rough job only. The block is shown in Fig. 21 with the boring bar in place.

For the final finishing of the three bearings a reamer is used. This reamer is .001 of an inch larger than the crankshaft journal and carries a pilot block ahead of the cutting edges. Thus when the cap is firmly fastened to the block and a fairly accurate hole has been bored through the assembly, the pilot block steers the reamer through the bearing.

The reamer is long enough to take in the three bearings. Being of steel and carrying cutting edges it lines up all three bearings as near perfect as possible. The reamer removes from five to seven thousandths of an inch of metal and leaves a smooth finished surface. The rotary cutting blades of the reamer tend to "lay" the metal around the bearing in the natural position for carrying the journal.

In Fig. 5 are shown a number of views of babbitt bearings and these will serve to illustrate the various points which we wish to make.

At A is shown a bearing which has been bored but not fitted; the dotted line shows approximately how much metal, comparatively, must be removed by hand scraping even after the lower half has been finished, or if the lower half has been salvaged.

At B, the crankshaft journal is shown in place and the cap is resting upon it. The cap cannot be put in place

quent happening, and this bearing must be scraped or bored in such a way that the dotted lines of the circle, representing the crank shaft journal, will form the bearing surfaces.

F illustrates a finished bearing, round and accurate and .001 of an inch larger than the journal to insure a film of lubricant.

The hand scraping method is a costly one and the chance of scraping the bearings slightly out of line is a very probable one. By the Wilson method, boring and reaming, the bearings must be in line. By this method it is possible to ream the bearings just enough larger than the journals so as to insure a film of lubricant at all times—thus the machine need not be "run in."

The common mistake of many mechanics is that they want to see a bearing "spot-in" all over, and then, assuming such a condition, they are prone to tighten up the bearing cap so snugly that the crankshaft can hardly be turned over.

Bearings Soon Cause Trouble

Under such conditions it is to be expected that the engine will soon cause trouble. The bearings will expand from heat, the heat will dry off much of the oil and the bearing will soon wear itself out, not smoothly but in spots and the work must all be done over again.

Mr. Wilson says that in his experience he has found that a bearing, perfectly "spotted-in" and tightened to a perfect fit, will pound itself into a circle with from .0025 to .003 of an inch clearance after a few hundred miles of running. But during that time the bearing must be flooded in oil or it will be destroyed.

By the Wilson process the bearings are given a .001 of an inch clearance, enough so that the caps can be tightened without binding upon the shaft, then the machine is put into the running in machine, figure 23, where it can be watched and kept supplied with oil.

This whole process is much similar to that adopted in the Ford factory, the machine being shown in Fig. 6.

It will be noted that the machine illustrated in figures 20, 21, 22 and 23 is designed to take all of the work so far described and that from the time of babbitting to the finished "running-in" operation the block is mounted on a fixture from which it is not removed.

The connecting rods are fitted in this same way after the pistons have been installed and the blocks have been rebored, where necessary.

Not every Ford engine requires reboring each time it is overhauled, in fact it is not advisable to rebore a block unless necessary. The life of the engine block depends upon either or both of two things, the amount of metal in the cylinder walls and the metal in the valve seats. (Assuming that the block has not suffered breakage of parts, it is assumed in our statement that the life of the engine block is affected by normal wear only.)

Each time the block is rebored the walls are thinner and normally the block cannot be rebored or reground more than three times. For this reason each cylinder should be examined very carefully before reboring. It

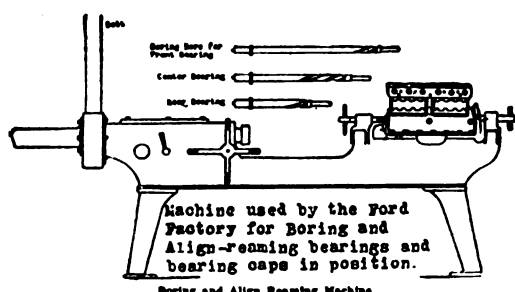


Figure 6

unless the proper amount of metal is removed.

At C, is shown a re-babbitted bearing and the dotted lines show the finished journal size. The rest of the metal must be removed, either by scraping, boring or reaming.

At D, is shown a bearing which has been bored but not reamed or fitted.

E illustrates a bearing which is "off center," a fre-

should be calipered for roundness and the walls examined for deep scratches or scores. An oval cylinder can be used but will never give satisfactory service. A scored cylinder may be filled and scraped without regrinding, but smooth, round walls are essential for good service.

In explaining this portion of the repair work, the re-boring of the cylinder we can do no better than to quote from Mr. Wilson's own paper on the subject. Reference is made to Figures 7 and 8.

"The old method of boring the cylinders 'all one size,' and hoping to find pistons to fit them, has been abandoned as obsolete, unsatisfactory, and expensive, because Ford pistons vary so much from the size they are marked that hand fitting, filing, turning or lapping in is necessary to turn out even a fair job. All of this extra work contributes towards the cost of the finished product.

Fitting the Pistons

"The new pistons are first marked '1-2-3-4.' They are then measured (fig. 7) with a 4-inch micrometer, first for roundness, by measuring them across the skirt in the direction of the wrist pin; then at right angles to it.

The piston is then laid on a block of wood, with the high side up, another block laid on top and a few sharp taps with a hammer will drive it back into its original roundness. A little practice will enable a repairman to do this operation in one minute to each piston.

"Now measure the piston again to determine its exact size, and mark on the piston the amount of oversize. For example: Suppose the piston measures 34/1000ths oversize and is marked 31/1000ths. It means that it is 3/1000ths too large, so the markings on that piston should be 3-O. S.

"The next piston might measure 27/1000ths oversize, marked 4-U. S. and so on for each piston. This micrometer 'E' (fig. 8) is then used to set the single bladed cutter 'C' and used as follows: Size of the piston 27/1000ths oversize plus 3/1000ths more for clearance, total 30/1000ths. one half of that is 15/1000ths or size to set the micrometer. Then turn the adjusting screw out until the cutter touches the micrometer and you have the proper adjustment to bore that cylinder, for that piston, the cylinder will be just 3/100th larger for clearance. If the next cylinder is larger or smaller, turn the mi-



Figure 7

crometer dialed adjusting screw to the right or left, the desired number of points (laid out in marks of thousandths) and you get absolutely any size you may want. The adjustment is single and effective and easily understood by amateur repairmen.

"The boring bar is now placed in the cylinder and is instantly located by means of two (two-piece) locating

plugs "1" as shown in cut. The permanent guides "g" are then positioned and fastened to the block on both cylinder head and crank case ends. The tapered locating plugs are then removed through the openings provided, leaving the boring bar all set up.

We now place an "S" wrench on the square end of the boring bar, and with another speed type wrench, tighten the adjusting screws of the split bearings on each of the permanent guides until it requires considerable pull on the 8-inch wrench to turn it. Please note that it is impossible to bore a tapered or uneven hole unless you purposely allow these bearings to become loose and a sloppy fit for the boring bar. Now place the universal joint in position and throw in the feed lever. In nine minutes the cylinder will be rebored, during which time no other attention, except setting up, is required.

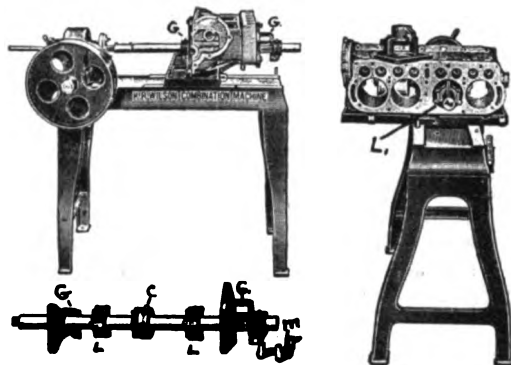


Figure 8

"The table holding the cylinder block contains two No. 5 taper pin holes and one 7/16-inch cap screw hole opposite the center line of each cylinder. Corresponding holes are drilled into the bed of the machine and by moving the table with the cylinder block attached on the bed, any cylinder can be brought into exact location wherever the pins will fit into place.

"It requires about 1 3/4 minutes to set up for each hole in this machine and nine minutes to bore it, making a total time of 43 minutes, but on account of the automatic feature, not more than 10 minutes labor cost can be charged boring the cylinders, for the reason that the operator can be grinding valves, fitting pistons, connecting rods, or overhauling the transmission on many other jobs while the machine is taking care of itself.

"It is not necessary to tie up your cylinder reboring machine while the cutters are returned to the factory to be resharpened and fixed up. During which time, it might be necessary to hold up your customer's job or take the work out to a competitor. The K. R. Wilson cutter is constantly adjustable to take up any wear, and on account of the narrow cutting edge will not dub over when it hits a hard spot or scored cylinder.

"A narrow cutting edge could not be used with any other equipment other than a cylinder bolting bar and having a fixed guide on each end that will prevent chatter and keep the cutter from digging in or following the old hole.

(Continued on page 58)

Automobile Dealer and Repairer *America's Latest Hobby*

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M. T. RICHARDSON
President and Treasurer

F. R. WHITTEN
Secretary

M. T. RICHARDSON, Editor
FRANK L. AVERY, Managing Editor
H. M. MENDEL, Associate Editor

F. R. WHITTEN, Advertising Manager
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MISSING NUMBERS—Our readers should remember that we are
always pleased to re-send numbers which have gone astray in the mails.

Department Staff

WITH this issue we start a new "Ford Car Department." We have long felt the need of a subdivision in our regular Trouble department, because there are so many questions which relate purely to the Ford car. The average automobile engine is built along certain lines, in general all automobile engines are alike, but the Ford engine is different.

Because the Ford car differs radically in many ways from other cars its trouble symptoms are different. When a subscriber tells that there is a knock in his engine we go over the symptoms and diagnose the trouble but if he says that the engine is a Ford, then our diagnosis may easily be entirely different than though it related to an engine of another make.

Within the next few months it is our purpose to start still another department, a few pages devoted to "Tires" and their repair. When one considers the cost of maintaining a car one realizes that the tire expense is often the predominating one. Gas and oil are fairly constant and follow the law of averages, but the tire figure jumps from low to high like the temperature in September.

We feel that these two new departments will go far to make our magazine of value to our readers. We invite criticism and can safely promise that any just criticism or suggestion will be given careful consideration.

THERE is something else besides a flag which is waving over our homes at present, the wireless wave. Go where you will into any home and you will either be invited to listen to the latest jazz racket or a broad cast weather report; or you will be invited into the next door neighbor's house to sit with a rapt expression on your face as strains of sweet (?) music pour forth from a glorified telephone receiver.

The old world is moving on, or as the modernist would put it, "jazzing along" and is tuning her steps to the gallop of the wireless hobby. There is absolutely no doubt in our minds but that the wireless hobby has come to stay, today it is nothing more than a fad but tomorrow it will be as much of a necessity as our morning paper. Possibly the wireless will put the newspapers out of business in much the same way that the motor truck has mangled the revenue of the trolley car system.

At the present time we have but little choice as to our wireless programme, we can listen to the buzz of the telegraph or we can hear the stuff being sent out from the nearest broadcasting station. Sooner or later, however, doubtless there will be arrangements made whereby the government will broadcast weather reports, news items, things of political significance and other stuff of public interest. The wireless instrument will become as much of a home necessity as the telephone and central's silvery question of "number?" will cease to bother us. We will talk with our friends, and transact our business by wireless without the need of a central office.

"But how will this make any difference to the automobile industry?" We can seem to hear you ask. We feel that the new wireless hobby will, in the near future, be closely associated with the automotive industry in many ways.

To use a comparative expression we might say that the automobile industry is a rather husky boy at the present time while the wireless hobby is an infant of only a few months. We predict that the infant will be helping the boy over the stormy ways of life in a few years hence and be the latter's mainstay in life later on.

Wireless will soon become a fourth dimension in business. Each local automobile firm will wake up to the possibilities of this new hobby and in a short time you may expect to sit beside your cosy fireside, happily listening to a pleasant concert and suddenly to hear, loudly above the music—"Come into Schmit's service station tomorrow and have your ignition looked over, we'll do it free."

At first this advertising scheme will be worked to death, you won't be able to enjoy any regular concert for by the time Schmit has ceased his merry chatter brother Brown will tell you about a new supply of lettuce he has just received, brother Harris will try to sell you a Spring chicken for your Sunday's dinner and Jones will tell you all about two cows and a spavined horse he is disposing of at lowest prices.

The air will be full of bargains, so full that it runs over

and your wireless receiver will be heated to a cherry red, to say nothing of your temper. And away in the distance, hidden behind the local advertising, will be the selection from the opera which you want to hear.

And as you start for business in your automobile, a receiver strapped to one ear, a transmitter on the top of the steering gear you will be able to finish the conversation with your wife. You can call the office and start dictation half an hour before you reach it; hoping all the while that your stenographer doesn't mix your dictation with that of the fellow in the Ford who is trying to wireless his repairman what his opinion of the car is.

And should your machine cast a shoe or break an axle you need not worry about the two mile walk to the nearest

telephone, simply stay in the driver's seat and send out an S. O. S. to the nearest repair station for help.

The wireless phone starts where the telephone ends, it makes possible communication from moving trains or automobiles to distant points without anything but the equipment. The wireless equipment for receiving may all be packed in a box two feet square or less and operated from the storage battery on the car. The cost of such equipment is little more than the cost of a good tire and the apparatus is far more entertaining.

The wireless hobby is a good one to ride, and many there are who will ride it to the limit for it is going to help every one in many ways and its possibilities are those of another dimension.

Two Home Made Fittings

Suggestions for the Construction of an Oil or Fuel Strainer and a Sight Feed Fitting

By F. L. Adams



IN another article in this issue we mention the fact that oil from the pump or fly wheel housing of the Ford engine should be put through a strainer before it is drawn through the pump. In the same article we mention a sight feed oiler and though these two devices are considered as a part of an auxiliary oiling system, we describe them separately because they have their use in other ways.

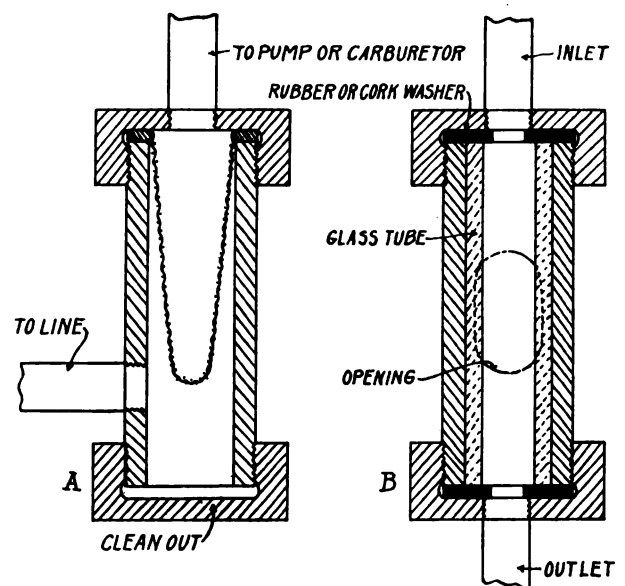
The oil strainer which is illustrated in our sketch at A can also be used to advantage for keeping dirt out of the carburetor. The device can be made from parts ordinarily found in a plumber's shop or a general hardware store, a pipe nipple, two pipe caps and a small piece of fine copper wire gauze.

The body of the device is made from a piece of 1½ inch brass pipe, four or five inches in length. This is a regulation size fitting called a "pipe nipple" and is threaded on both ends to take other pipe fittings. The two pipe caps fit over each end of the nipple. The top cap being bored and tapped for a ⅛ inch pipe fitting. The nipple itself should be tapped, just above the last thread for a ⅛ inch pipe thread. The drawing A is clear enough to show this.

The Gauze Strainer

Before making the gauze strainer one should make a paper pattern in order to see just how the thing should be cut. The pattern should be made as follows. Mark out an eight inch circle and cut it out of the paper. This circle will make four strainers, so draw the two opposite diameters which will cut the circle into four pieces and use one of the quarters for your gauze pattern. (Just like four quarters of a pie).

By bending the quarter circle of the gauze into the shape of a cornucopia or cone shape with an overlap at the open end of one inch the top will be about the right size to lap over the retaining ring. The ring at the top may be made from number six or eight copper wire and the gauze soldered to it. The open seam from the top to the point may be stitched with fine copper wire. The cone should be long enough to hang almost to the bottom of the fitting in order to give the largest surface for straining possible.



The pipe leading into the side of the nipple is connected with the flywheel housing, if used on an oil pump for the Ford car; to the lowest part of the oil pan, if used on any other kind of car; or to the gasoline supply, if used for straining fuel.

The top pipe should lead to the oil pump or carburetor

as the case may be. The device may be cleaned by removing the lower cap. By this system the sediment, dirt or water naturally sinks to the bottom and the strainer will not be clogged so quickly as if the supply lead into the top.

The second device illustrated at B requires a little more careful workmanship and though its greatest use is for showing the passage of a liquid, such as oil through the oiling system, it may be used for showing gasoline or oil levels.

As an instance of this consider the fuel system on the Ford car. The tank is located beneath the seat and when $\frac{1}{4}$ full the level comes just above the toe board. If one wishes to use this device to indicate gasoline level one may mount it so that when the tank is $\frac{1}{4}$ full, the level comes to the center of the indicator. In such a case it is only necessary to connect the lower part of the indicator (marked "outlet") with a T coupling in the fuel line and leave the upper part (marked "inlet") open. However a tube should be carried to the highest point, beneath the hood, or the gasoline will run out through the top.

The indicator is made from a $\frac{3}{4}$ inch brass pipe nipple four inches long, two flat faced caps; a length of "boiler

glass" and two rubber or cork washers. All joints should be made up with orange shellac.

The two caps are tapped for $\frac{1}{8}$ inch pipe and the glass tubing cut off about $\frac{1}{4}$ of an inch longer than the brass nipple. A long, oval opening is made in the brass nipple so that the glass tube is in view.

The sketch shows the complete assembly and is marked "inlet" and "outlet" for use with the oiling system described elsewhere in this issue. The device, one must remember, indicates whether or not oil is flowing through it and has absolutely nothing to do with pressures. However it has many advantages over a simple pressure indicator.

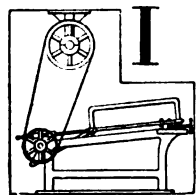
When an ordinary pressure indicator is used it shows only that the pump is working and does not show that all of the tubes are clear. In this device, however, should the pipes become clogged the oil will back up into the indicator and thus evidence trouble at once.

We strongly recommend that every car be equipped with such a "flowage" meter even though it has a pressure indicator on the dash. The device may be mounted in the dash and a round, nickel plated disc used at the front to present a neat appearance.

Buying Ford Accessories

There Are Many Things One May Purchase
But the Actual Necessities Are But Few

By the Editor



IN OUR last "Special Ford" issue we published an article relative to the *selling* of Ford accessories and we assume that the writer did his best to show the salesman how to sell his goods. But there is another angle, which might be of interest to the salesman as well as the buyer, in the accessory game—that of buying.

Unquestionably it pays to buy Ford accessories and there seems to be hardly any limit as to the various kinds one may purchase. The Ford owner who has the cash to spend, who cares not how he spends it so long as he satisfies his "hobby," could buy one new accessory a day as long as he lives without exhausting the market. Assuming that he owns a new Ford car it will be advisable for him to purchase several trucks if he intends to "fully equip" his original machine with all the accessories sold. By the time he finishes buying accessories he will have spent upwards of five thousands of dollars and still be behind the game.

Take the matter of gasoline savers and economizers alone. The story goes that a Ford owner was hailed into court for raising an unseemingly horrible racket. He had carried several pails dangling beneath his car and was reprimanded by the court. When asked for an explanation of his singular conduct he produced a paper and

pencil and launched forth into a series of percentage figures which he claimed could not lie.

First he had installed a new carburetor, guaranteed by the makers to save 25% of the fuel; he had installed a vaporizing attachment which saved 15% more; an air valve used 15% air instead of fuel and accomplished this amount of saving; patented spark plugs saved 5% more; the new ignition system was guaranteed to save 15%, while the valve in head block was covered by a forfeit if it did not produce more power with a saving of 25% of gas. With this equipment he obviously saved 100% of the fuel and it had not been a difficult matter for the salesman to sell him still another device, a spark intensifier with special features which "would surely save 10% and probably 15%" of the fuel. This additional saving he planned to catch in the pails beneath the machine and carried several, in order that no fuel would be lost.

Although figures do not lie they can be trained to do some interesting tricks and the "accessory boys" are excellent figure trainers. We must admit that the car owner is rather helpless for he really needs some accessories while other devices may be "luxuries" to be purchased only when he has the spare cash.

At the risk of offending some of our good friends we will do our best to tell the new owner a few of the things he should surely have. Please realize that we do not

intend to mention the "must have" ones first; we assume that he already has the regular tool equipment.

An hydrometer is a necessity and should be carried at all times. There is one type which fits into a bottle (quart size) and the supply of distilled water is carried in it. The battery is worth upwards of \$30 and the hydrometer, with regular weekly inspection is cheap insurance.

A tire gauge will pay for itself in a few months. Keep your tires properly inflated and you will add hundreds of miles service to their lives. The average tire equipment costs four cents a mile to maintain. Improper inflation, conservatively estimated, will result in a loss of from $\frac{1}{4}$ to $\frac{1}{2}$ a cent a mile. Assuming a seasonal mileage of only 2000, proper inflation will save from \$5 to \$10. Regular use of a tire gauge will result in the saving of at least \$5 per year. And its cost is only about $\frac{1}{5}$ of that figure!

Tire Repair Materials

Since we are on the subject of tires we might mention tire chains, tire repair patches, a blow-out patch, cement and a tire pump. The man who drives without a set of tire chains is a criminal, without repair materials is a thief and without a pump is a fool. (Gosh, but I'm getting into trouble!)

But, quick, read the next three paragraphs! Give me time to explain before you start to oil up the gun or tie the slip-noose for my neck.

Without tire chains you are a criminal because you are responsible for what your car does and should it skid and cause a death, then you are liable. You are just as much to blame for leaving off chains as you would be blamable for giving a revolver to a three year old child.

Without tire repair materials you become a thief, a gentle one perhaps, but one nevertheless because you will, sooner or later, be obliged to "borrow" (?) from some stranger.

And you are a fool to go without a tire pump because you cannot blow up a tire with your mouth. It is almost as foolish for one to carry a pump that doesn't work, though many of us are guilty on this score. The pump should be carried in a little compartment all its own for if it should be dented by contact with a hammer or other object its days of usefulness would be over.

The Jack Has Many Uses

A jack is almost as necessary as a pump, unless you are strong enough to lift your car. The jack comes in handy, not only for changing tires, but for getting the car out of the mud, expanding rims, etc.

Every single reader, and every driver in the country for that matter, is sure that *he* is too careful to cause an accident,—“it's the other fellow we are afraid of.” And because the other fellow is always the careless one a front and rear bumper, for our own protection, are excellent accessories to buy.

Of course none of us ever expect to have our car

break down and as for being towed home—perish the thought. At the same time we might need a tow rope—perhaps we may have the glory of towing home one of our friends. Or maybe we may attend a lynching bee and the tow rope will come in handy. At any rate a tow rope lends a feeling of security to any flivver.

Speaking of accidents which might happen, how about a windshield cleaner? Personally I wouldn't be without one; in fact I'd rather go without a spare tire and be a fool without a pump than take a chance on Summer weather without some sort of a cleaner.

While a trouble light is not exactly a necessity it has often helped me out of some bad messes. I have mounted a double contact socket on the dash, just beneath the hood and when something goes wrong at night I can plug my trouble lamp in and with 12 feet of cord get to any part of the car. Should the wires leading to the socket go wrong I have an extra socket with two lead wires into which I plug the light and connect the socket directly with the battery. If the light does not work then I know that the trouble is in the battery and the light wouldn't help me anyway.

It seems hardly necessary to mention a mirror for that is legal equipment or requirement in many states. Even though the mirror is not a legal requirement in all states it still remains that it is a mighty handy accessory.

To my mind the Ford equipment is painfully lacking in one way, it had no oil gauge. The fellow who writes the instruction book tells his readers that the oil level should be exactly between the upper and lower pet cocks; too high and the engine smokes, an evil habit; too low and the engine goes on a strike. Only an expert spirit medium or an improved ouija board could tell when the oil level was correct in height, and not all of us are mediums or ouijasts. An oil level gauge, kept clean, is a good investment.

The Ford Radiating System

The Ford radiating system is of the thermo-syphon type, hence the water must be above the upper connection or it will not cool efficiently. The worry of watching the water level may rest heavily upon your mind and if it does, then buy some sort of a device for indicating either the water level or telling the temperature.

I'll mention only two more accessories and then I'm through; a water vaporizer or humidifier for putting water vapor into the intake manifold and a full set of leather boots for the springs. The humidifier will keep the engine clean from carbon for a long time and the spring covers will keep the chassis clean from squeaks. And both devices will keep your mind somewhat free from worry.

So now if you will review this article, list the accessories which I have recommended you will find that I've been very conservative. I haven't space to tell you what you *can* buy if you have the money. We have a 1100 page directory which will give this information and the Ford owner who intends to "fully equip" his flivver should first hire a warehouse.



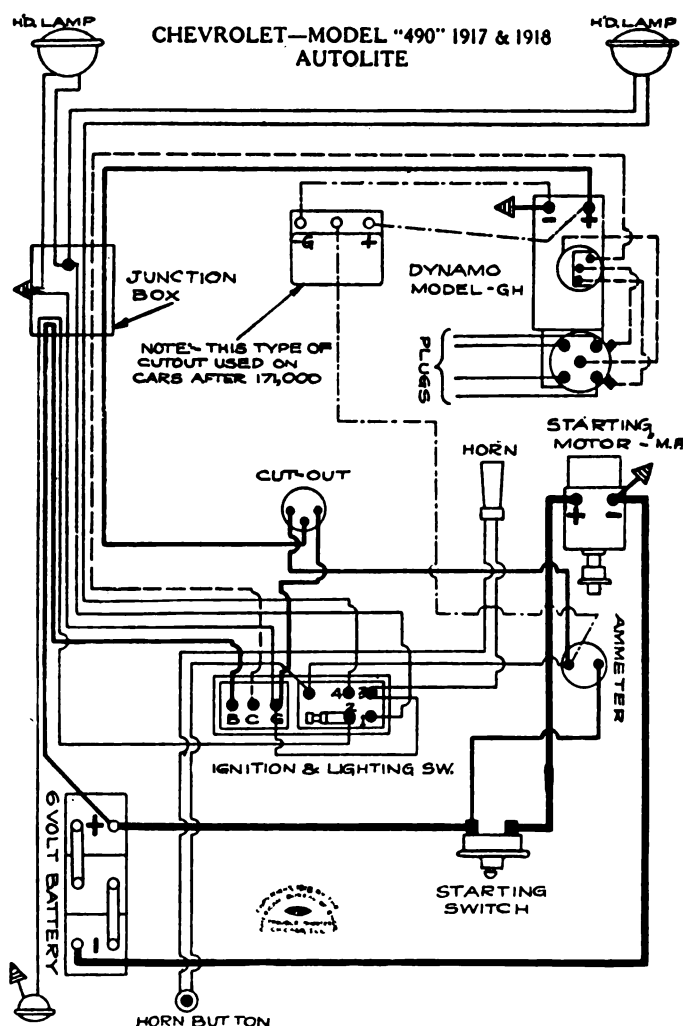
The Master Vibrator

3100

From Adolphus Brizee, New York: I would seek a little advice in regard to a Ford car, equipped with a Heinz coil which is giving me some trouble of late with the coils—skipping and misfiring, especially in going up hill. I have had the vibrators adjusted time and again. It will run O. K. for a little while and then the same old trouble again. Some garage men tell me I want a master vibrator installed, and others say I want new points on the old coil boxes. Now what I wish to know is if one vibrator is as good as four would be, and would you get the same power from your engine with one as four? Is a master vibrator a proper device to install on a Ford car for good results? I know very little about the electric system of ignition.

Reply: A master vibrator of proven merit is unquestionably an improvement over four separate vibrating

coils, as it dispenses with the difficulty of making four separate adjustments. The more regularly the spark is caused to take place in relation to the pistons' travel the greater will be the efficiency derived from the motor; then again it is difficult when four separate coils are used to locate the one causing the trouble. The fact that thousands of master vibrators are in use on Ford cars and as we know that many owners that have used master vibrators again purchase when they procure new cars, would seem to be authentic evidence of their reliability and usefulness. Of course your trouble may be caused by your timer having become worn. When this is the case the skipping you refer to will be more noticeable at higher speeds, still again your ignition system may not be at fault. We have frequently seen cases similar to yours which have been caused by the inlet or exhaust valve sticking. All valves are likely to warp slightly from the intense heat, with the result that the stems bind in the guides, which do not allow their setting properly and of course produce missing. To ascertain if this is the fault remove the cover plate over the valves and by means of a screwdriver put more pressure on the valve springs. If this remedies the trouble procure new valve springs, and it will be well to remove the valves and carefully draw file the parts showing bright. If you find your timer is worn it can be replaced in a few minutes for a couple of dollars.



Chevrolet Wiring Diagram

3101

From E. M. Wells, Wisconsin: Will you kindly send or print the diagram of the Model 490 Chevrolet Car? This machine has a 6 volt, Auto-lite starting and lighting system.

Reply: The wiring diagram which you request is reproduced in the first column on this page.

Carbon Trouble

3102

From Alfred Johnson, Georgia.—I own an Overland car, five-passenger touring. I am having, and have always had, annoyance by carbon collecting in the cylinders and under the exhaust valves, causing them to have to be ground quite often. I use a good grade of oil, keeping it on a level with the drain cock in the oil reservoir. The car is almost new, so I shouldn't think that the piston rings are loose or would leak enough to cause this carbon

trouble. Kindly advise me on this and also suggest a simple and effective way to remove the carbon. What do you think of running kerosene through the air intake of carburetor while engine is hot?

Reply: Your oil may be, as it probably is, too thin. We advise you to try a heavier consistency oil. Every oil manufacturer makes several different oils, no one being best adapted for every make of car. If change of oil does not remedy the trouble you will probably have to have the engine disassembled to see whether or not new pistons and newly ground cylinders are necessary. If your trouble was in one or two cylinders only we should not attribute as the probable cause the use of an oil of too thin a consistency. There are a half dozen or so of different ways of removing carbon. But if your cylinders are badly carbonized, we advise you to take the car to some good repairman. He will remove the carbon quickly and at little cost.

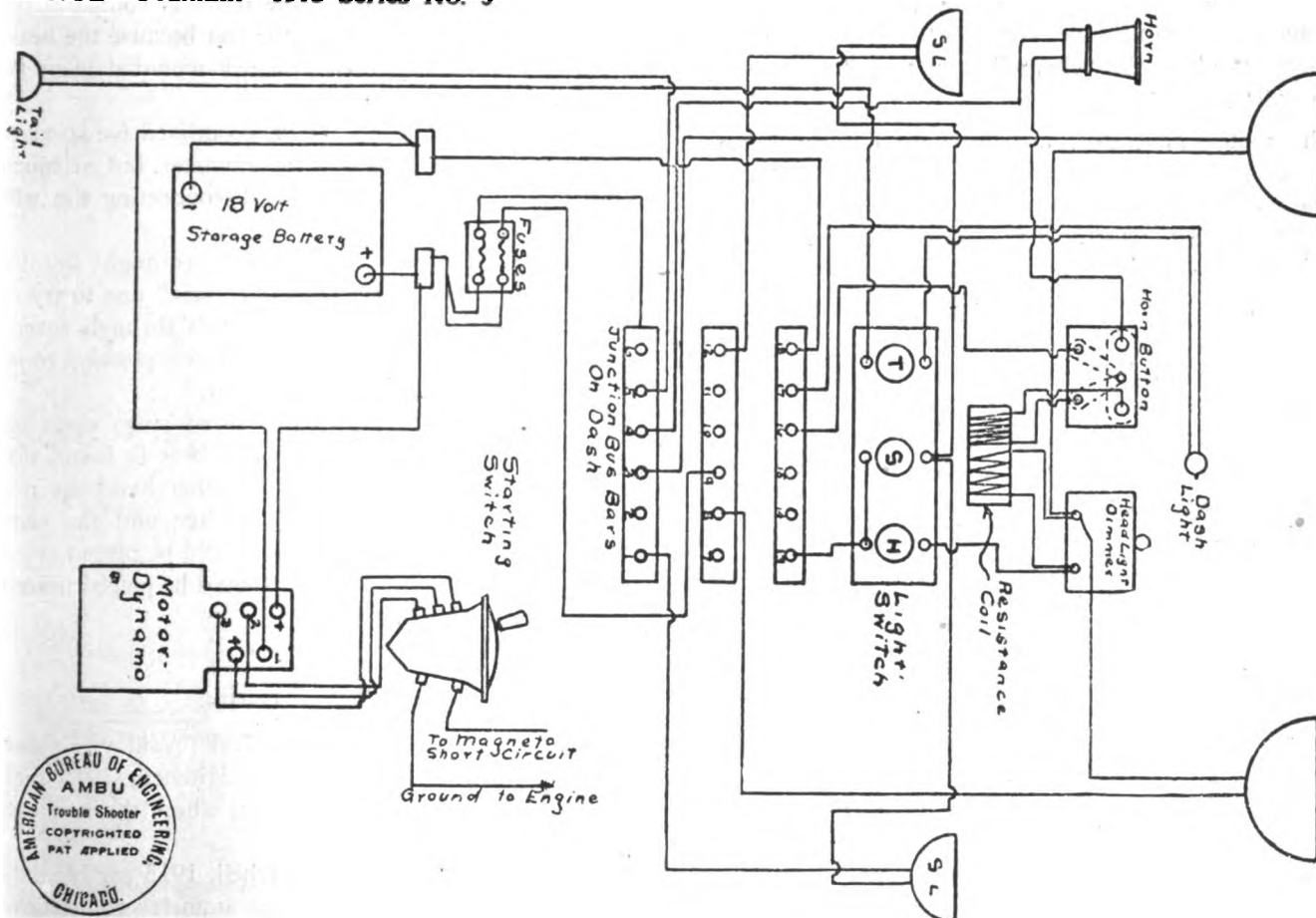
Wiring of 1913 Franklin Car

3103

From Arthur S. Warner, Florida: I have an old Franklin car, which, I think is Series 5, 1913 model. The starting-lighting system is 18 volts and the motor-generator has five terminals on it. The starting switch is on the dash. I would like to have you send me a wiring diagram of this car, if possible.

Reply: The wiring diagram requested is printed below.

ENTZ Franklin 1913 Series No. 5



Ammeter on Chalmers Model 26

3104

From a Louisiana subscriber: I have a Chalmers light six, model 26 which is equipped with an 18 volt battery and a single unit Entz starting-lighting system. Now although this old car is still "going strong" there are times when I feel that the generator is not charging the battery. But there is no current indicator on this machine and I want to put one on it; can an ammeter be installed on this model?

I would like to install a single new ring on each piston, would you advise me to install it at the top or bottom of the piston?

Reply: It is all a matter of conjecture as to whether the ammeter may be installed on this model or not. Our records show two types of generators possible on this model, one type was equipped with a current indicator, the other was not. The two types of motor-generators differed only in the internal connections to binding posts and for this reason it is probable that an ammeter may be connected to show charge and discharge.

However in many of the older cars the ammeter or "current indicator" was used mainly to show whether or not the generator was working properly and did not always show a discharge from the battery. This may have been the case with this car.

Regardless of whether the ammeter will show a discharge or not it still has its value for if the generator is producing a current it is to be assumed that the current

Engine Will Not Stop

3106

From F. Mc Gann, Massachusetts: Will you kindly tell me why my Cadillac engine continues to run even after the ignition has been turned off? It pounds along sometimes for two minutes after the switch has been turned. The valves are seating properly and the carbon has but recently been scraped out. The trouble is noticeable only after the engine has been running for some time.

Reply: There are a number of reasons why an engine runs after the ignition is off. Carbon trouble is probably the main reason but you have evidently eliminated this source of pre-ignition.

Pre-ignition may be caused by overheated parts; that is to say sharp edges of valves, spark plug electrodes, small projections in the cylinders, etc. which heat easily, tend to remain red or white hot long enough to ignite the fresh gas and naturally the engine keeps on running.

It is often possible to choke off this pre-ignition by opening the throttle suddenly after the ignition switch has been thrown off. Many Ford engines are prone to have this trouble, for the Ford engine runs hot much of the time. In the case of the Ford engine the choker valve is pulled closed and the engine stops immediately.

Another cause for pre-ignition is extreme compression. The Cadillac is naturally a high compression engine and with its small cylinders it is a very easy matter to jump the compression above normal. If new pistons or connecting rods are installed, or new cylinder heads, it is possible to decrease the combustion chamber to such a point

that the compression is high enough to ignite the charge.

Remove the cylinder heads from your engine and scrape out the carbon and see that there are no small bits of iron which might overheat. Try to use spark plugs that have large electrodes. Test the compression and ask your service station man what compression this particular model should have.

One Non-Skid Tire

3107

From J. R. Heinz, Indiana: What will be the result of using a plain or smooth tread on one rear wheel and a non-skid on the other?

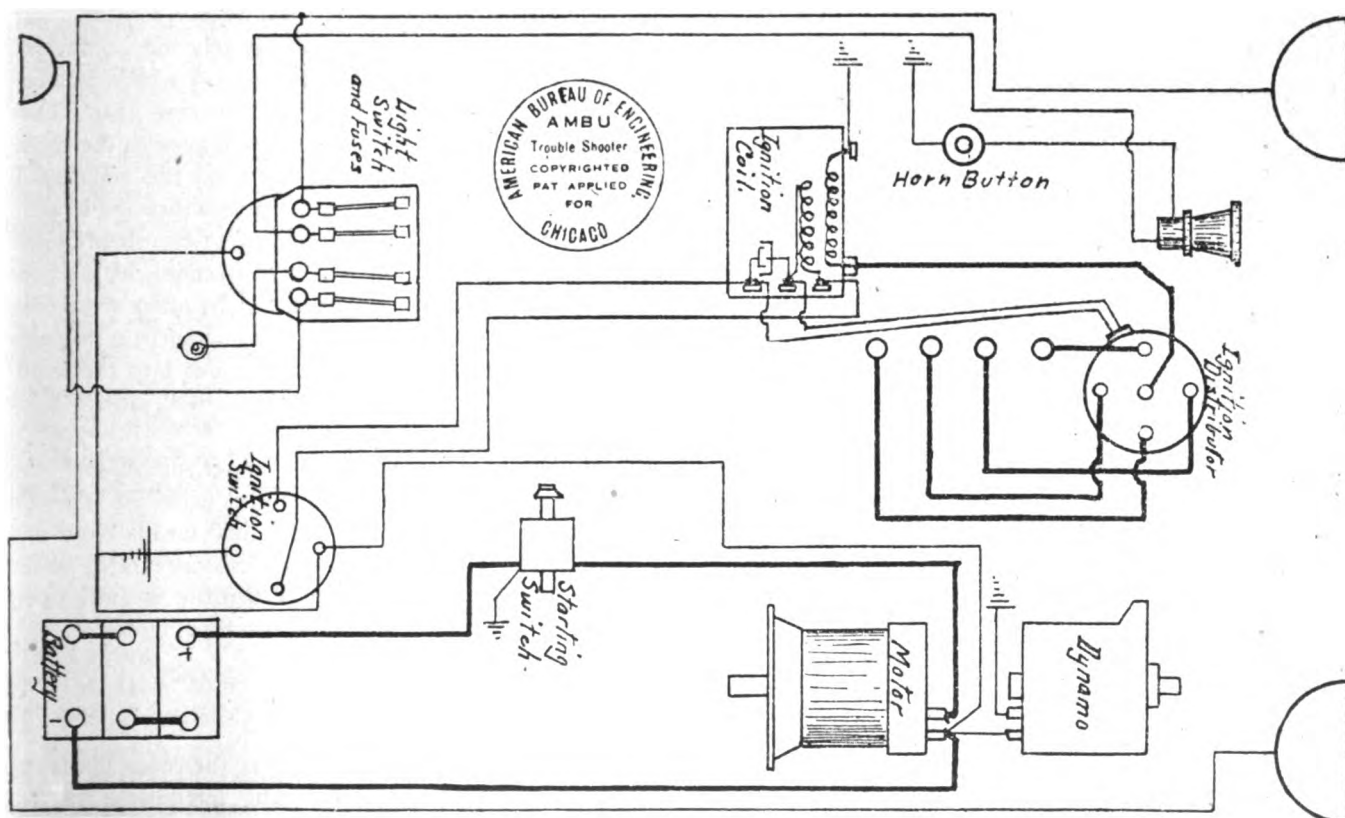
Reply: There will be no result save that the smooth tire will tend to skid if occasion arises while the non-skid tire will not. In ordinary driving there will be less appreciable effect than might be imagined. It is better to have one non-skid tire on slippery roads than none, and better to have two than one.

Hupmobile Model N Diagram

3108

From Harley E. Avery, Connecticut: I am overhauling my 1916 Hupmobile and would like to have a wiring diagram of the starting and lighting system. Will you please give me one?

Reply: The wiring diagram of the Model N, 1916 Hupmobile is reproduced on this page.

BIJUR Hupmobile 1916 Model "N"



Overhead Valve Equipment

From C. L. Vennum, West Virginia: Will you kindly tell me the various advantages of the special overhead valve cylinder heads which are made for Ford cars?

Reply: There are a number of advantages embodied in the overhead valve system for Ford cars over the regular equipment. It has been generally conceded that the overhead valve system, if used on large bore cylinders, admits the gas or allows it to escape much easier than the side valve system.

If you will draw a sketch of the inside of the cylinders as fitted with overhead valves you will see that they are much the same as an umbrella with the valves at the top. Upon the intake stroke the gas is drawn through the intake port and it hits against the head of the valve, and is immediately mushroomed out like water hitting the center of the top of the umbrella.

Under these conditions the mixture slides down the walls and meets itself at about the center of the piston where it quickly works upward, driving the exhaust gas ahead of it. Thus the exhaust gases are pushed up to the top of the firing chamber and in such a way that they form a little ball of dead gas practically surrounded with fresh gas. The exhaust gas remaining after the explosion, a very small amount perhaps, does not mix so easily with the fresh gas, under these conditions, as before.

By the use of overhead valves it is possible to increase the valve area. This means that the cylinders can be cleared more rapidly than with side valves and that the intake stroke will fill the cylinders with no chance for a partial vacuum, no matter how fast the engine is running.

With the side valves there is a large amount of dead space which serves to pocket dead gases and which makes the compression ratio much lower, per inch of stroke than when overhead valves are used.

Although there are many differences of opinion, in general it is believed that the overhead valve engine does not tend to collect carbon so readily as the side valve machine.

With standard valve equipment the average Ford engine is limited in its speed to about 2000 R. P. M. under average load. With overhead valve equipment the engine can be operated as high as 3000 R. P. M. or higher if the parts are properly balanced. The overhead valve system is usually installed on Ford racing cars.

Headlight Bulbs Burn Out

From C. T. Mercier, Maine: I have a 1917 Ford car which is giving considerable trouble by burning out the headlight bulbs. We have installed new wiring but the trouble continues, can you give any suggestions?

Reply: We assume that you have connected the headlight bulbs in series. You should run one wire from the magneto post on the dash to one headlight. This headlight should be of the double contact type and the other wire should lead to the other headlight, through it to the ground. The bulbs should be 6-8 volt and the headlight reflectors, upon which the bulbs are mounted, should be clamped into place with a piece of rubber or pasteboard between the clamps and the reflectors. This will reduce vibration somewhat.

You will be able to obtain, from a toy store, a small, electric train rehostat. This rehostat is nothing but a round wood block upon which are mounted a coil of resistance wire and a switch bar. The bar slides along the coil of resistance wire and allows more or less current to pass through it. Mount this rehostat on the left side of the engine, fairly near to the rod which connects the throttle rod with the rod on the steering gear. Connect the rehostat switch bar in such a way with the throttle rod that when the throttle is closed the rehostat is "On" and the maximum current can pass through it.

Under these conditions the opening of the throttle will swing the rehostat arm along the resistance wire and the current will gradually be diminished. In other words the faster the engine runs and the more current the magneto generates, the more resistance will be put into the headlight circuit. Thus the headlight bulbs will always burn brightly but will not burn out.

By making the rehostat arm longer or shorter the amount of resistance in comparison with the throttle opening may be controlled. By this means you can set the rehostat so that all of the resistance is in series with the lighting circuit when the throttle is fully open and no wire is in series when the throttle is closed.

"The customer is always right" is the sales platform of one of the largest merchandising institutions in the world.

Filler Rod Manipulation

Little Attention Very Often Paid
to This Important Part of Work

by David Baxter



USUALLY the student welder is taught a great deal about adjusting, regulating and manipulating the welding torch and its flame. He is cautioned again about keeping the flame regulated, and as a general rule no pains are spared to instruct him in the art of handling the flame in relation to the melting metals, and in its relative size according to the weight and kind of metal to be welded.

In fact, it can be truthfully said no doubt, that every apprentice welder and every student of the welding schools graduates with a fair knowledge of this part of the oxy-acetylene welding trade. As a result probably all beginners have a good working knowledge of the action of different molten metals under the welding flame.

Other Items of Importance

This is all very important and as it should be but there are other items so closely allied to flame manipulation as to be almost a part of it; in fact of very little less importance. They seem, however, to form a subject which is often neglected by welding instructors. Some of them seem to take it for granted that the beginners will naturally assimilate the idea as they go along, or that the only thing necessary to know about manipulating the filler metal is that it is to be fed into the melting weld.

For it is to that we refer: The manipulation of the filler rod. All welders should know that there is a certain technique in handling the rod just as much as there is to the operating of the torch and flame; that the placing of the filler metal is just as important as selecting the right size and kind for the job at hand.

Using Filler to Advantage

The beginner may learn that the filler rod can be manipulated to an advantage or adversely to the interest of the finished weld. That is, he can handle the rod in a way to make the melting easier, and better, besides avoiding the chance of spoiling the weld. Not only will he be able to make the work less laborious but will be able to gain strength and solidarity in the joint. The laying and mixing of the filler is equally important with the melting of it.

Now it is with the forgoing ideas in view that this article is written. An effort has been made to correct what may be a wrong impression and at the same time furnish a basis for working out a better system of instruction in filler rod manipulation, in the depositing

and saving of metal as well as the factors of time and labor.

Consider first generalities: The novice usually grips the filler rod with what might be termed a death grip. He exerts considerable muscular power and as a result soon tires. If long continued, the action puts him in such shape that he cannot obtain the deft touch so often needed.

The continuous tension of his fingers and arm muscles renders his movements jerky and uncertain and he is

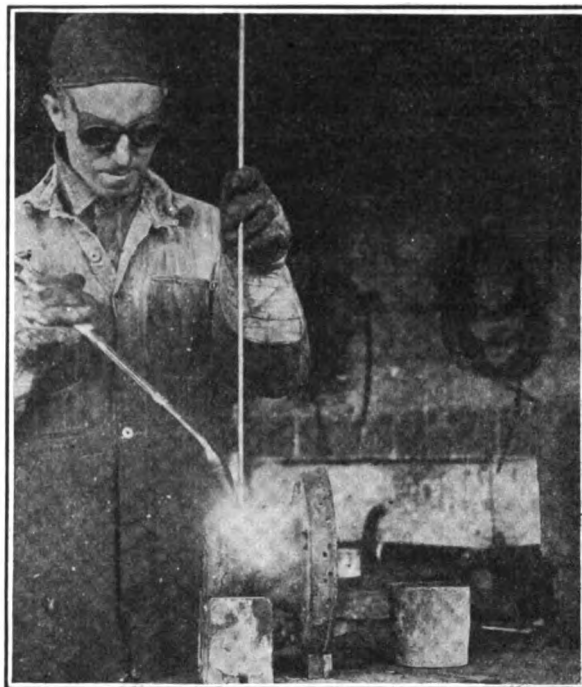


Fig. 1. The brazing rod resting its weight in a vertical position.

unable to execute the rhythmic rotating or twisting motion necessary to make the molten filler mix with the melting weld metal. Even though he finally becomes accustomed to the strain he probably will not acquire the sure touch so essential on many jobs.

The whole idea might be compared to writing, since anyone knows how tiring it is to write with a tight grip on the pencil and the muscles contracted. The action is cramped and the writing poor, without rhythm and without deftness.

An experienced operator holds the filler rod in his fingers lightly, almost with a show of nochalance. His muscles are normally loose, but ready for instant action when it is necessary. He is ready to flirt a bit of slag out of the bath, or employ the quick knitting twist necessary to break up the oxide and flow the metals to-

gether. Usually the rod is held in the left hand, which makes it that much more difficult to guide when the arm and hand muscles are tired.

Another part of the technique of filler rod manipulation is the holding of the rod at a certain angle or in a certain position. Some authorities urge the holding of the rod at a certain angle to the flame and molten bath while others recommend some other angle. Some favor a sawing movement in preference to twisting or churning.

With due regard for preference the writer of this discussion does not favor any particular one as a fixed rule. In fact he does not believe the beginner should permit himself to become "set" in any form of rod manipulation, but should endeavor solely to make the filler work in harmony with the flame and with the melting condition of the weld.

Watch Flame and Weld

In other words, he should watch the flame and the melting weld and adapt the manipulation of the rod to their actions. Sometimes it may be necessary to hold the rod perpendicular, sometimes at a wide angle, and other times almost parallel to the line of welding. If the weld melts slowly or rapidly, or readily, or with difficulty, the rod should be handled to suit that condition.

The feeding of the new metal to the weld is a matter of some little skill, too, in spite of the general indifference

clean the weld of dross or slag it should be thoroughly done and the feeding process resumed.

If the rod size is correct and the proper size flame is employed for the kind and thickness of the job, then the filler should flow in systematically and precisely, not haphazardly, in splotches.

The best illustration of this, perhaps, is in brazing. In that case the filler metal must be spread evenly and quickly. It must be applied when the fracture is in the right receptive state. It must be applied freely, since brazing is merely an adhesion; where the filler metal is not mixed with the casting metal. The filler is often piled up along the joint to lend added strength.

In brazing it is essential to hold the rod lightly and manipulate it deftly. The weight of the rod itself is usually sufficient, with only movement enough to spread the molten bronze. When possible, the rod is held in a vertical position and allowed to rest with no other pressure on the casting. Then the flame is manipulated to prepare the surface of the casting and at the same time melt the rod.

This is well illustrated in Fig. 1 which shows the brazing of a wire wheel hub. The rod is balanced on end while the flame spreads it out over the surface of the hub. Movement sufficient to keep the brazing continuous is all that is employed, with now and then a quick dip in the flux pot, which is handily placed within reach of the torch operator.

Overhead Brazing or Vertical Work

Of course in overhead brazing or vertical work, the welder must grip the rod, but even then he can catch it nearer the middle where it will balance and thus relieve the strain. Where an extra quantity of brazing filler is needed the rod is allowed to drop to an angle to one side or the other while the flame is played directly upon it, or the rod is moved farther away from the flame, when a smaller amount of filler is needed. These, however, are merely cases of making the flame and filler work in harmony as mentioned above.

A "Stunt"

Sometimes an ingenious welder will shift the torch quickly to his left hand and manipulate the rod with his right. This is illustrated in a posed picture captioned Fig. 2. The position of the rod at a wide angle is also clearly indicated. Such a device is often employed on a heavy job where it is not feasible for the welder to change positions, or in close quarters where he must make the weld all from one direction; he cannot melt properly without shifting the direction of the flame and so must shift the torch to his left hand.

The wide angle approach is employed principally where the V-groove is deep. It permits the operator to melt larger quantities of the filler and at the same time twist the melting rod into the molten sides of the sloping groove; an effect which is sometimes gained by holding the rod parallel to the line of welding but still in a wide angle position, rolling it gently over in the trough as the



Fig. 2. Method of holding the rod at a wide angle with the torch in the left hand.

which seems to be the custom. The rod should be fed into the melting groove of the weld as gradually as possible, with no prodding or twisting as long as it is flowing freely. The filler is fed in where the weld is ready to receive it and not forced to pile up where the job metal is in no condition for it, and when essential to

two metals melt. Meanwhile the flame is played over both to bring them to a molten state in unison.

Fig. 3 shows the relative positions of the torch and filler rod when welding a vertical seam on sheet metal where the sheets are butt-welded. In this the weld is worked downward with the torch leading the filler. This is no doubt the best method, since the metal may be all kept alive and thus prevented from dribbling down over the part already finished as it tends to do when the direction of the welding is upward.

The rod metal is applied to the joint only as fast as it is needed and the force of the flame is utilized to guide and shape the molten metal. Thus in blowing upward it tends to prevent the filler from running down to clog the unwelded portions of the joint.

Deft Filler Manipulation Necessary

Thin sheet metal welding, particularly the butt-welding style, requires exceptionally deft filler manipulation. If the rod is clumsily handled, or pressed too heavily upon the joint, the weld will present a rough, unpleasant aspect and will be more apt to warp. There is also great danger of melting a hole through the sheet; or at least pushing it through with the rod if this is handled stiffly and awkwardly.

Most of the ungraceful handling of a filler rod is overcome by practice. The torch operator acquires self-confidence and graceful poise by the right kind of practice after he is given the idea of how to go about it. The flame and filler swing in harmony until they seem to be almost a part of each other. The operator becomes so accustomed to handling the torch that he unconsciously swings the flame without effort at precision. The flame advances and retards with the application of the filler.

Difference of Opinion

As stated in the beginning of this discussion, one welder will advise one thing while another favors the opposite. Where one prefers to weld toward himself along the fracture, the other prefers to weld away from himself. Still others weld sidewise along the joint with the filler rod leading or following according to their custom.

Generally it seems to be only a matter of personal opinion, although there are arguments in favor of either course; there are times when one or the other is the best. Probably the position of the casting requires certain methods, or some projection may interfere with other procedures.

No Set Rules

It is these things the student should be taught as well as the actual mechanical elements of the trade. He ought to be able to adjust himself to unexpected situations without loss of time.

The best advice to beginners in regard to filler rod manipulation may possibly be not to form any fixed habits but to handle the metal according to the way the metal reacts to the heat of the oxy-acetylene flame. That is

to manipulate the filler rod in conjunction with the flame and according to the needs of the melting.

In other words, adopt no special method of handling a filler rod for all classes of work. Be ever ready to shift from one style of technique to another several times during one job if necessary. Above all, the novice

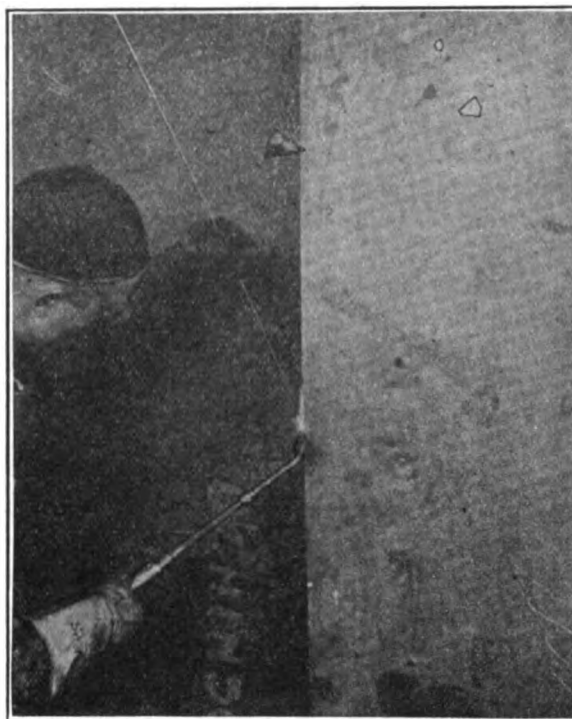


Fig. 3. Relative positions of rod and torch when welding down a vertical seam.

should be cautioned that the manipulation of the rod is a part of the trade as much as regulating the flame or handling it.

By watching the conditions of the flame and metals the welder can often save a deal of time and worry. He learns to handle the weld by instinct as it were. He makes the necessary changes without conscious effort. He knows the proper angle to hold the filler without having to stop and reason it out. He shifts from one position to another with no mental effort, so to speak. Then he has mastered two of the main elements of the oxy-acetylene welding process.

LOCKING NUTS

by Edward Ingram

WHEN a car is being repaired or overhauled, too much stress cannot be laid on the importance of locking nuts securely in place after they have been tightened up. This may appear to the reader to be a rather trifling thing to make the subject of an article, but so many car failures are due to improperly secured nuts, bolts, and screws, that it is believed the subject is worthy of special attention.

The nuts on automobiles are particularly apt to come loose because of the constant vibration due to road shocks. A locomotive, for example, runs on smooth

steel rails with the result that the nuts and bolts are much less apt to jar loose than in the case of the automobile. In the motor boat there is practically no vibration from external causes. Even the aeroplane is not subjected to vibration from road shocks, except from the short interval that the plane runs along the ground before rising, or after alighting. The rapid depreciation of the automobile is almost entirely due to the fact that it has to run on all kinds of roads.

Failure to properly lock nuts, screws and bolts in place after they have been tightened up is often the reason why a car breaks down shortly after it has been overhauled at the garage.

Such failure is almost certain to disgust the owner of the car and cause him to patronize another garage thereafter. Thus the garage owner may lose a valuable customer through the carelessness of his mechanic.

Just think how foolish it is for the mechanic to spend hours of time carefully adjusting the bearings and then leave the nuts on even one of these bearings so that they are free to either jar off entirely or to slacken up enough to ruin the adjustment. Even where the nuts do not hold a bearing in adjustment just as serious things may result from not properly locking them.

In most of the cars being built today some means is provided for locking the nuts that the manufacturer has found by experience are apt to jar loose. For this reason when disassembling a car the mechanic should carefully note which nuts are locked in place as if lock washers, for example, are used, these may become lost and there is then nothing to indicate whether the nuts were originally locked in place or not.

In the case of old cars quite often it is found that the makers have failed to provide a means for locking nuts that jar loose very easily. In this case it is up to the mechanic to remedy the matter by himself providing means of locking them. The engines of very old cars quite often are not as well balanced as they should be with the result that there is considerable vibration, which causes certain nuts to jar loose that would stay in place on engines of more modern design.

Probably the well-known method of using a cotter pin in connection with the drilled bolt and castellated nut familiar to every mechanic, is the most reliable way of holding a nut in place. There are, however, several faults with this arrangement, and to ensure the nut being locked properly these must be guarded against by the mechanic.

Consider the lower connecting rod bearing, for example, where castellated nuts nearly always are used to hold the bearing cap. After the proper number of shims have been applied and the nuts are set up the manufacturer drills the transverse hole through each bolt or stud in a position such that when the cotter pin is inserted it will pass through the slot in the nut and prevent it from turning. After the car has been run some time, however, the bearing wears and some of the shims have to be removed in order to take up the wear. After this has been done it will be found that upon setting up the nut the cotter pin hole is no longer in such a position that the pin will pass through the slot in the nut owing to the fact that the nut screws considerably further down the bolt.

(Continued on page 59.)

New and Useful Automobile Accessories

The Reminder Reserve Valve

We reproduce herewith illustration of the Reminder Reserve Valve for use on Ford cars. This excellent device is being manufactured by the Standard Valve Company, 314 Prospect Ave., Cleveland, Ohio,



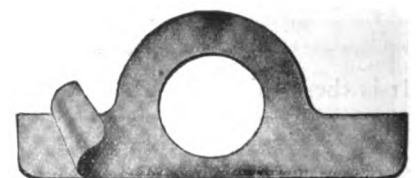
the owner from thinking that there is plenty of gasoline in the tank when it is nearly empty and awakening him to the fact that he has forgotten to see that the tank was filled with gasoline.

When attached to the Ford car it works in this way. When the gasoline tank is full, the ring on the heel-board is pushed in as far as possible. If the motor begins to miss or stop, thus showing that the gasoline is low, the ring is pulled out as far as possible. There will then remain about five quarts of the precious fluid so that the car can be driven to the nearest filling station.

The device is low-priced, and we should advise readers to write to this company for full particulars regarding it, mentioning the Automobile Dealer and Repairer.

son it is vital that the shims are of the proper thickness. But to take care of the various thicknesses required is a difficult matter, an adjustment of .001 of an inch in thickness entails the use of several different sized shims.

We call the attention of our readers to the "Laminated Shims" which are being made by the Laminated Shim Co., Inc. 209-14th St., Long Island City, N. Y. These shims are made in various sizes to fit practically every type of bearing. They are furnished in thicknesses from 1/64 to 1/8 inch



Laminated Shims

and they make these Reminder Reserve Valves for Buicks, Fords, Dodges and Overland fours.

The manufacturers state that this device, when installed on the car, functions as sort of a silent alarm clock, preventing

Everyone who has had anything to do with the adjusting of main or connecting rod bearing caps realizes that the shim plays an important part. The caps must be supported entirely upon the shims or it will bind upon the shaft. For this rea-

with laminations of .002 and .003 of an inch.

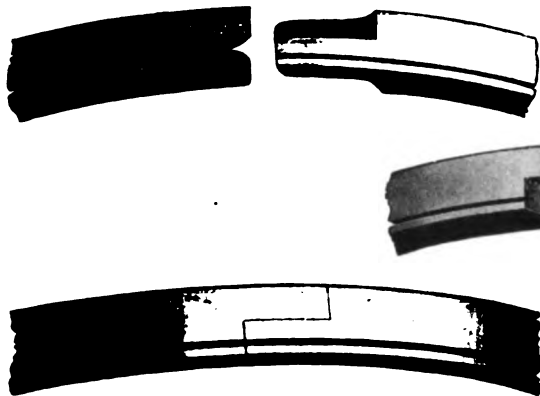
When such shims are used it is only necessary to peel off one of the laminations and the thickness of the shim is decreased by that amount.

The Everyday Piston Ring

Our illustrations show the joint in a new ring which is being placed on the market by the Everyday Piston Ring Co., Inc., of East Rochester, N. Y. The makers

An Interesting Rotor

An article of unusual merit in the Ford ignition field has recently been placed upon the market by the White Brass Castings Company, 1650 West Grand Av., Chicago,



claim many advantages for this patented ring.

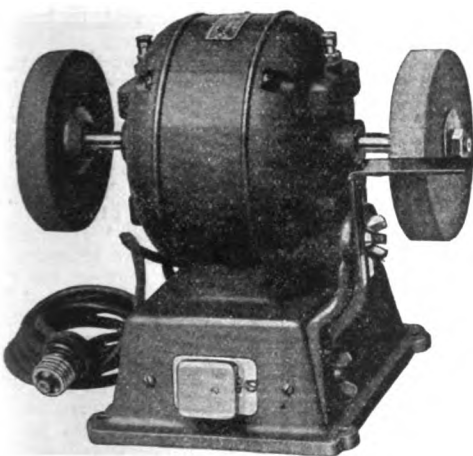
The joint, as will be seen from the illustrations is of the double interlocking type, that is to say the joint overlaps in two directions. A beveled groove in the face of each end is overlapped by a corresponding tongue on the opposite end.

By this construction there is no chance for gas leakage past the joint. The ends of the ring are self locking and should the groove wear permit an upward and downward action the locked ends cannot open.

Luther Electric Bench Grinder

We illustrate herewith the Luther electric bench grinder manufactured by the Luther Grinder Mfg. Company. There are a number of features about this grinder which make it worthy of attention. It is suitable for use in small shops for sharpening and polishing tools. The specifications are as follows: $\frac{1}{4}$ h. p. single phase motor 110 volts, 60 cycles, 1750 r. p. m.

Complete information relative to this grinder and the other grinders which they manufacture may be obtained by writing to the manufacturers. Their claim is that "there is a Luther grinder for every



sharpening purpose," and that they are the "oldest and largest makers of tool grinders in the world." Write to Dept. R, Luther Grinder Mfg. Co., Milwaukee, Wis.

Ill. It is a neatly designed, well made rotor that fits any type of Ford timer shell, replacing the ordinary timer rotor.

Many advantages are claimed for this device, but chief among them is the entire elimination of all ignition troubles that are due to oil being present on the contact surfaces.

No lubricant is required in the timer when using a Master Rotor as the special brush used is the genuine "Blendite," composed of copper, graphite, and two other metals thoroughly blended. Should any oil enter the timer shell from the motor through the cam shaft bearing and cover the fiber track, and steel contact segments, the oil film is instantly broken by the wipe contact of the Master Rotor brush and quick starting assured no matter how cold the weather.

Practically every make of ignition device now being manufactured employs in its design some principle of the wipe contact using some form of copper or composite brush. There is not a single commutator or distributor in use today employing the roller principle or permitting oil on the contact surfaces except the Ford type of timer.

It is said the Master Rotor assures an improved electrical contact—because of the perfect "metal-to-metal" surfaces, an oil-less timer—because the lubricant is incorporated in the brush, long life to the timer because all the wear is concentrated on the brush without any detrimental mechanical or electrical effect, easy starting, even in the coldest weather—because there is no oil upon the contact surfaces to congeal.

Big Price Revision on Piston Rings

The American Hammered Piston Ring Company's list price has dropped to sixty cents. The Baltimore concern's production and sales during the past two years have made them one of the leaders in the piston ring field and the increased volume permits the new price. Special sizes, five inches and above, command a somewhat higher figure, but all standard sizes of these automatically hammered rings sell for sixty cents. The special Ford Type ring with its .136" to .150" wall thickness is priced at fifty cents.

This saving to motorists will be reflected in the lowered cost for over-hauling in preparation for Spring and Summer. Many car owners have already taken advantage of the new prices which went into effect

March 1st. An unusual demand is reported by the home company in Baltimore.

New President for A. Schrader's Son, Inc.

A. Schrader's Son, Inc., of Brooklyn, New York, announced on April 3d that Mr. M. Charles Schweinert, who has for over thirty-five years been associated with it in various capacities, such as General Manager, Treasurer, Director, and President, has resigned his official position with the company. Mr. Schweinert has, however, because of his wide knowledge of the corporation's business and his engineering and mechanical skill, been retained by the corporation in an advisory capacity.

As Mr. Schweinert's duties in such capacity will occupy only a portion of his time, he contemplates devoting the remainder of it to other engineering and mechanical matters and to looking after his private interests.

Mr. Henry P. Kraft, Vice-President and Treasurer, who has been associated with the Schrader company for the past thirty-nine years, succeeds Mr. Schweinert as President of the company.

This firm has been in business since 1844, and in addition to the manufacture of diving apparatus of all kinds, is one of the largest manufacturers of automobile accessories.

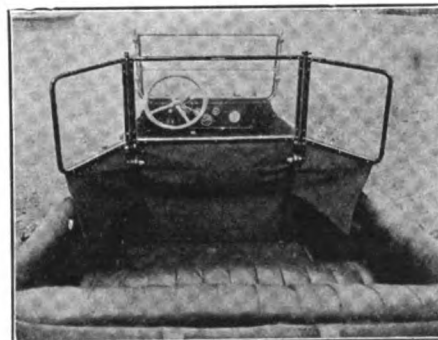
J. H. Stationary Tonneau Shield

A new style shield for use on smaller cars has just been brought out by the Tonneau Shield Co., Inc., 47 West 63rd St., New York, N. Y. This device called the "J. H. Stationary Tonneau Shield" is sold at a very low price and it is easily attached, it being only required to put four bolts or lag screws into the seat, thus making it unnecessary to remove any of the upholstery. The rods which run down take the entire strain.

The shield is made in one size and one finish—all black. It can be made up in any other finish if desired, at an extra cost.

The cut illustrating this article shows the shield on place on a Dodge car.

Readers who are interested should write



to this company for full information in regard to the device which they manufacture.

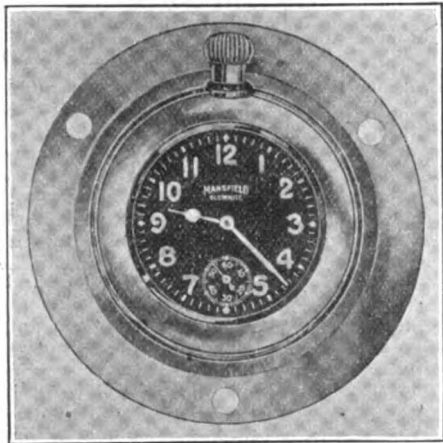
A New Goodrich Tire

One of the latest additions to the tire family is the new Goodrich, "55" clincher tire made in 30 x 3 and 30 x 3 1/2 inch sizes. The appearance of the tire, as a whole, is excellent, it has a rugged, non-skid tread design with full size cross-section dimensions.

Glownite Motor Clocks

For some time there has been a demand for a moderate-priced automobile clock which would assure permanent accuracy and good appearance. Two motor clocks now on the market are designed to fill these requirements.

The Glownite Motor Clock is a radium-dial timepiece, made of nickel silver which it is claimed will not rust, tarnish or "spot."



Though it may be attached in a few minutes by means of three small bolts and nuts—without cutting a large hole in the instrument board—it cannot be removed without taking considerable time and trouble—making it practically safe from theft. Mounted in a special vibration-proof case, the works are protected from shocks.

The Paramount, a trim 'silvered-dial clock,' with numerals clearly outlined, is intended for the use of motorists who do little or no night driving. Aside from the dial and a slight difference in shape, it is similar to the Glownite in all respects.

Glownite and Paramount Motor Clocks are manufactured and sold by J. F. Mansfield, 9 Maiden Lane, New York City, very reasonably priced.

Bearings Service Opens Second Canadian Branch

The Bearings Service Co., with general offices at Detroit, has opened its second branch in Canada, selecting Winnipeg, Man., as its distributing point for the western section of the Dominion. A successful branch has been operating at Toronto, Ont., for some time, but the growing use of automotive vehicles in Canada has made western expansion necessary. Winnipeg is recognized as the distributing point of the automotive industry in western Canada, and was naturally selected by the Bearings Service Co. as the location of its new branch.

W. L. Spain, a native of Winnipeg, has been selected for manager of the new branch. Mr. Spain is an old automobile man and has already made an excellent record as a district manager for the Chevrolet Motor Co.

The Bearings Service Co. acts as the service department for Timken, Hyatt and New Departure bearing companies. It was formed for the purpose of giving country-wide, immediate service from stock of new and genuine bearings. Complete stocks are carried by every branch and distributor.

Victor Adjustable Visor

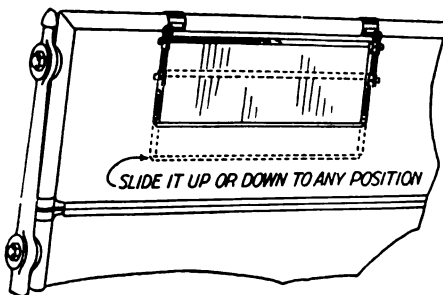
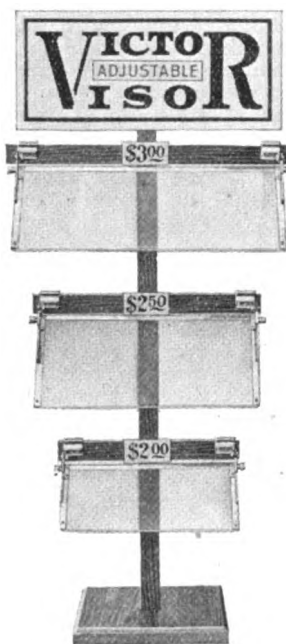
We illustrate herewith the Victor Adjustable Visor and as the reader will see by this illustration, you can slide this visor up or down to any position to fit the needs of the driver. This visor is said to positively kill the strongest headlight glare and enable the driver to see plainly all objects on the road in the path of the approaching car. It is claimed that it kills sunlight glare, makes night driving safe and makes driving in the rain safe.

The shade of green used in this visor is pleasing and restful to the eyes. It is instantly attached on the inside of any windshield; positively will not rattle or get out of order; is adjustable to any position of the driver and with a flip of the finger is out of the way when not needed.

It is made of extra heavy, green, transparent material that will last indefinitely and bound on three sides with metal, bright nickel-plated, and the lower edge is crimped to stiffen it and not interfere with the vision. The clips that clamp the Visor securely on the inside of the windshield are of spring steel.

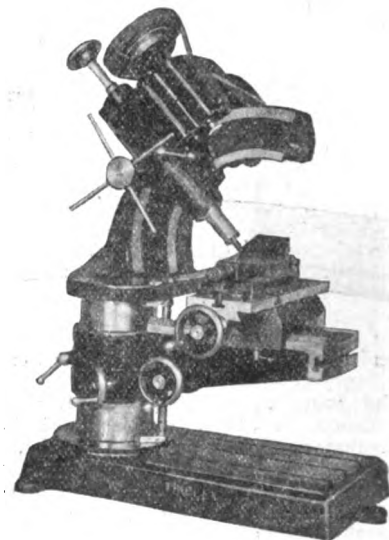
We also show a Display Stand for dealers on which the Victor Adjustable Visors can be shown to great advantage and anyone using this display stand will have no difficulty in making sales. The stand is made of mahogany finished wood, is well made, light and attractive, and every dealer gets one of these stands free if he places a fair sized order for visors.

For full particulars of this offer to dealers, as well as any other information in regard to the Visor, readers are requested to write to The Victor Mfg. Company, 11 St. Marys Street, Dayton, Ohio, not forgetting to mention this magazine.

**Triplex No. 1 Machine Tool**

The Triplex Machine Tool Corporation, 18 East 41st St., New York City are calling their Triplex No. 1 Machine Tool "three machine tools in one" because of its versatility. It can be used for turning and boring, horizontal, angular and vertical milling, thread cutting and drilling.

The illustration herewith shows it in position for angular and vertical milling.



To accomplish this, it is only necessary to move the spindle head on the radial arm which is accurately graduated in half degrees. A unique feature of this device is the fact that the spindle can be fed out of the head and locked in any position.

The adjustments necessary for the other types of work which this machine is capable of doing are very easily made. The rigid construction enables it to withstand heavy duty and the universal features of the machine save time in making job set ups, in many cases eliminating the necessity of changing the positions of the work when performing a variety of operations.

This tool is most assuredly worthy of the interest of our readers, and we should advise all those who are interested to write to the Triplex Machine Tool Corporation for further information relative to this noteworthy machine.

Air-Friction Carburetor

A new carburetor which is said to cut down gasoline consumption of any motor and reduces gasoline bills from one-third to one-half is the product of the Air-Friction Carburetor Co., 3310 Madison St., Dayton, Ohio. This invention is said not only to increase the power of motors from 30 to 50 per cent, but to enable every one to run slow on high gear. The manufacturers claim that you can use the very cheapest grade of gasoline or half gasoline and half kerosene and still get more power and more mileage than you now get from the highest test gasoline and that Ford owners can get as high as 34 miles to a gallon of gasoline.

So sure are the manufacturers of the immense saving their new carburetor will make that they offer to send it on 30 days' trial to every car owner. As it can be put on or taken off in a few minutes by anyone all readers of this paper who want to try it should send their name, address and make of car to the manufacturers at once. This company also wants local agents, to whom they offer exceptionally large profits. Write to them today.

The Wefco Spring Cover

Every car owner knows how annoying a full set of squeaking springs can be. He knows how difficult it is to work the lubricant between the leaves. The ideal method of spring lubrication is to keep the springs lubricated and to keep the dirt from them. This can be done only by covering the springs with some sort of a "boot."

The Wefco Company of 154 Nassau St., New York City, are making an attractive

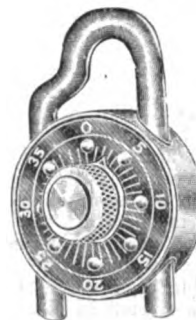
Universal Battery Company Methods

Although Universal Batteries have been serving car owners for over seventeen years, they have just recently been offered to Chicago battery users.

In opening the Chicago territory, the manufacturers have adopted a novel sales plan known as the "Universal Way," which really means "You pay for what you get and get what you pay for." Where free service is given the cost is generally added to the selling price. This is the reason

Universal Spare Tire Lock

In addition to being a distinct modern invention of unique character, it is claimed that this Steel Keyless Spare Tire Lock is a specimen of mechanical skill.

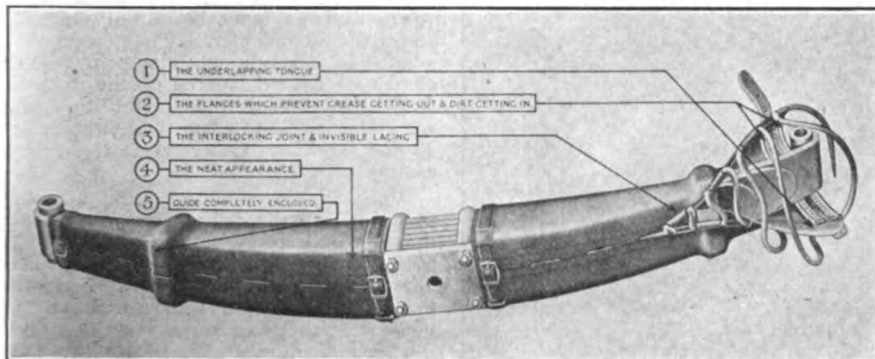


It is said to be absolutely fool-proof and trouble proof, operating smoothly, conveniently and quickly. There is no need to remove gloves or dig for keys.

Sturdily built and made of the best quality brass, rust-proof throughout, this lock will withstand 850 lbs. crow bar pressure and is fully guaranteed.

No two combinations are alike, and there is a lock for every purpose. The U. S. Navy has adopted the Steen and is now using over 100,000.

Complete particulars will be sent on request to the Triple Metals Corporation, Dept. K-5, Waukegan, Ill.



spring cover or "boot" which should be of interest to every owner. This cover is illustrated herewith. It will be noted that the cover encloses the entire spring and clips. Once the oil or grease has been packed into the spring there is no chance for it to work out. A few drops of oil put into the casing once a month suffice to keep the spring in condition.

for the unnecessarily high price of most batteries.

Mr. R. D. Mowry, general manager of the Universal Battery Company in referring to the new sales plan, says, "When we figure a retail price on our batteries we do not include service as a part of our overhead charge. If a motorist wants service we are prepared to serve him at a nominal charge. By eliminating service from our overhead, by doing business out of the high-rent district and by having our service station and factory adjoining each other, we are able to operate at a lower cost and at the same time save Chicago car owners real money on "Universal Batteries."

A plan has also been adopted, whereby dealers can sell Universal Batteries without making any investment. Cards of introduction are furnished dealers. They fill in the customer's name as well as their own. The customer presents the card to the Universal Battery Company if a sale is made, the dealer receives a check for his profits the same as if he carried batteries in stock.

The Universal factory and service station is located at 3411 Wentworth Avenue and 3410 South La Salle Street, Chicago.

The Bell Safety Bumper

The Bell Safety Bumper Co., Inc., Bush Terminal Bldg., Brooklyn, New York, are manufacturing a very complete line of bumpers for use on practically every make of car.

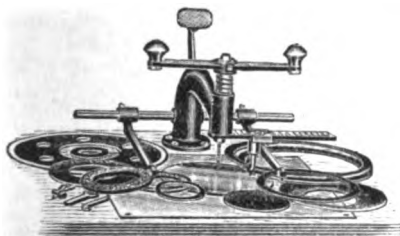
This company claims that the steel used in these bumpers is heat treated and oil tempered thus giving great strength and the ability to stand heavy shocks in collision without altering the shape of the bumper.

In attaching the bumpers there are no holes to drill, no special tools necessary and whole job is done quickly and easily.

It would be to the advantage of readers to write and get the fullest particulars in regard to this device and in writing, we would ask them to mention the Automobile Dealer and Repairer.

The Springfield Circle Cutter

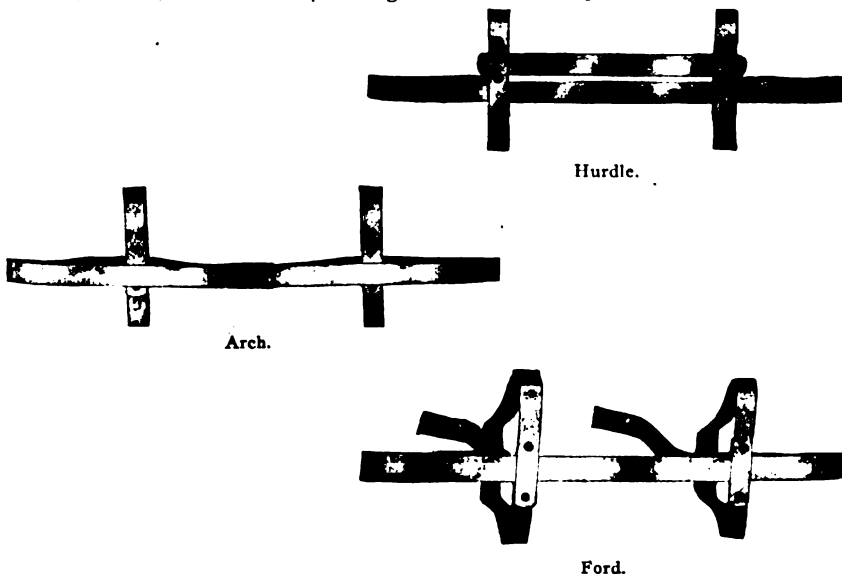
In every garage or repairshop a circle cutting machine is a very useful tool and we illustrate herewith the Springfield Circle Cutter No. 2 which is manufactured by The Shawver Company of Springfield, Ohio. This tool is extremely handy for cutting lamp glass, soft sheet copper and rubber



gaskets, felt and fiber washers, etc. It has a capacity for cutting any size of circle up to 14 inches. This machine may be mounted on an ordinary table or work bench having a smooth, level surface. An adjustable clamping arrangement is provided that will securely hold the work in place during the process of cutting. A positive measuring scale accurately determines the size of the openings. This scale is graduated in fractions of $\frac{1}{8}$ inch.

The Tool Carrier is so arranged that many different kinds of tools may be used, such as tools for engraving, marking, scoring, embossing, etc. A sheet of heavy cardboard or plate glass may be used under the work as a cutting foundation.

All cutting attachments are the same as on oval cutters which can also be furnished by the same company. The weight of the circular cutting machine is 30 pounds shipped. Readers who are interested should write for particulars and prices direct to The Shawver Company, Springfield, Ohio, and mention this magazine.



Ben-Wat Vaporizer

Greatly increased efficiency in motor performance, with reduced gasoline and oil consumption and prevention of cylinder carbonization are among the guaranteed claims of the J. W. Richardson Foundry & Metals Corporation, 11 Broadway, New York City, for its Ben-Wat Vaporizer for use on Ford cars.

The company is backing up its claims with an absolute guarantee that the Ben-Wat Vaporizer will save 25 per cent or more on gas bills and it states that some Ford car users are saving up to 61 per cent.

The Ben-Wat Vaporizer was designed and is built on the basic idea of the steam turbine—the mechanism that completely revolutionized steam engineering. The only difference is that while in the steam turbine the blades revolve, the Ben-Wat has the blades riveted in place. The gasoline is forced to whirl through the spaces between the blades with cyclonic force. Any liquid gasoline from the carburetor is caught by the blades where it is completely vaporized by the whirling air as it rushes past. The gas vapor in the turbine nest gets such a violent whirling motion that it continues to whirl through the hot upper



chamber where it is preheated to almost the combustion point into the cylinder—a hot, thoroughly mixed and vaporized, highly combustible mixture.

Tests of the Ben-Wat are said to have demonstrated the fact that its use absolutely prevents liquid gasoline from entering the cylinder. The only thing that can get past is completely vaporized mixed gas vapor, giving a clean, powerful explosion. Scored cylinders are caused by gasoline seeping down from the cylinder, washing away the lubricating oil between the cylinder wall and piston, leaving a bare metal-to-metal rubbing contact.

The housing of the vaporizer is aluminum and the nest of turbine blades is of brass, which will not rust or corrode from the gas. It will not clog—anything that passes the needle valves of the carburetor will pass easily through the blades. The manufacturers of the Ben-Wat declare that the device will outlast a dozen Fords.

Weston Appoints Sales Representatives

The following Sales Representatives have been appointed by the Weston Electrical Instrument Company of Newark, N. J.: Shiefer Electric Co. Inc. with offices at Rochester, Buffalo and Syracuse for upper New York State and Erie, Pa.

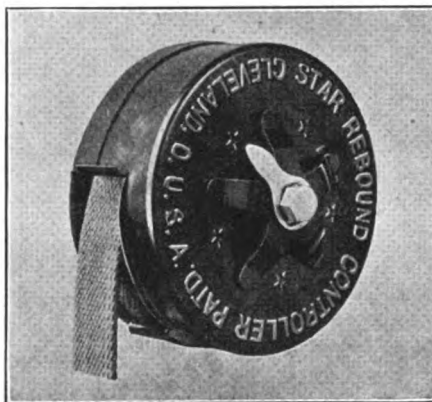
L. D. Joralemon, Otis Bldg., Philadelphia, Pa. for Pennsylvania, Delaware, Maryland and District of Columbia.

Warren C. Graham Co., Carondelet Bldg., New Orleans, La. for Louisiana, Mississippi and Lower Alabama.

The Star Rebound Controller

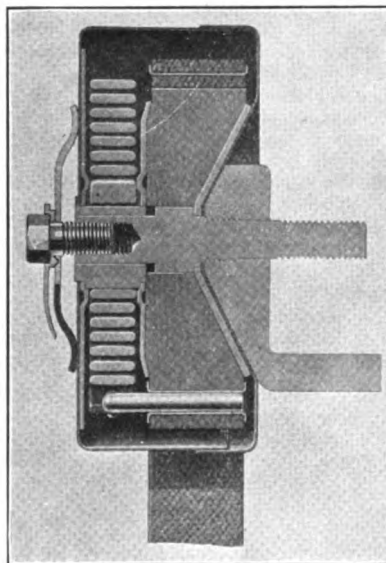
We illustrate herewith the Star rebound controller which is being sold by the Kansas-Snyder Mfg. Co., 1512 Lakeside Ave., Cleveland, Ohio. It is a well known fact that practically all of the jouncing caused by a rough road is due to the rebound. It is also conceded that the majority of spring breakages are due to rebound strain.

The Star rebound controller is said to



obviate all chance for excessive rebound. The controller is so constructed that the minute the springs are compressed the rebound strap takes up the slack. Then when the rebound strain occurs the controller offers a tremendous resistance to it.

The sectional view of this controller plainly indicates the various features of the device. Note that the bearing surface is cone shaped and large. The action can be controlled and the device adjusted to fit any car.



Witherbee Now in Charge of Markos

Thomas S. Witherbee, now connected with the Marko Storage Battery Company of 1402 Atlantic Ave., Brooklyn, New York, as general sales manager and director of advertising, is one of the pioneer manufacturers of storage batteries for automobile starting, lighting and ignition. He has been in the battery business since 1897, and has made several improvements in the storage batteries used in automobiles.

He is the inventor and patentee of the Witherbee Storage Battery Igniter, which was produced and sold by the Witherbee Igniter Company, founded by him.

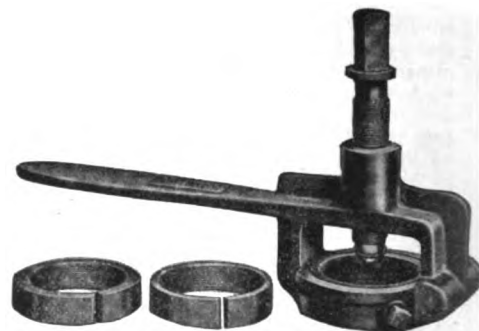
The Thomason Universal Wheel Puller

The Shepard-Thomason Co. of 506 West Pico St., Los Angeles, Cal. are marketing a wheel puller which, in the writer's opinion, will soon make an excellent reputation for itself. The Thomason universal wheel puller, as the device is called consists of three parts, a steel body, a set screw and a hub-thread adapter.

The body is fitted with a long handle for leverage and the set screw carries a steel ball, imbedded in it to prevent the upsetting or dragging up of the end of the axle.

The body is taper bored to receive the screw-thread adapter. The screw-thread adapter is merely a split ring with a thread on the inside and tapered on the outside to fit the body. With a set of only two adapters it is possible to remove the wheels from 23 popular cars. Other adapters for other cars may be obtained.

When the device is used the adapter is first put into the puller from the top and the assembly screwed upon the hub. As soon as pressure is brought upon the adapter the taper action of the body compresses the adapter upon the wheel and prevents the stripping of the threads. Our illustration shows the device and two adapters.



New Trade Literature

Smithsteel Running Boards are the subject of a new 8 page pamphlet published by the A. O. Smith Corporation, automobile frame manufacturers of Milwaukee. The description brings out the advantages of a complete madeup board, such as permanence, freedom from the usual rotting action of water and mud on wood boards—and the added resale value of a car equipped with this advanced automotive product. The illustrations in the booklet show top and underside views of the linoleum and all-aluminum top coverings.

It indicates that up to the time of printing, these new boards have been designed and are being produced for use on the following makes of cars:

Dodge, Buick, Overland Four, Ford and Chevrolet. The pamphlet is for general distribution to motorists, garages and manufacturers.

Faw Reduces Prices

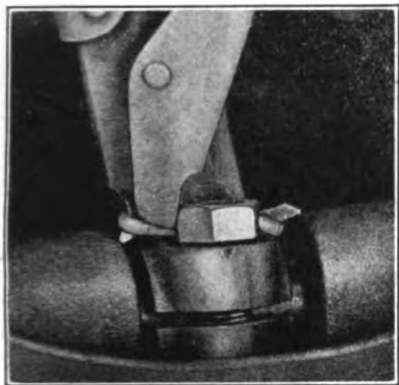
J. H. Faw Company, 27 Warren St., New York City, advise that on May first they are reducing list prices on their wrenches approximately 20%.

This readjustment is enabled by their heavy investment in machinery and up to date tools, and they state that they are glad to give their customers the benefit of this saving.

Tuban Cotter-Pin Puller

The accompanying illustration shows the Tuban Cotter-Pin Puller placed on the market by The R. Gannon Co., 424 Jamaica Avenue, Brooklyn, New York, Exclusive Sales Agents. The tool is shown in use removing a cotter pin from a bolt in a connecting rod. The size shown is for pulling pins up to $\frac{1}{8}$ inch in diameter, although a larger one is made for removing pins up to $\frac{1}{4}$ inch in diameter.

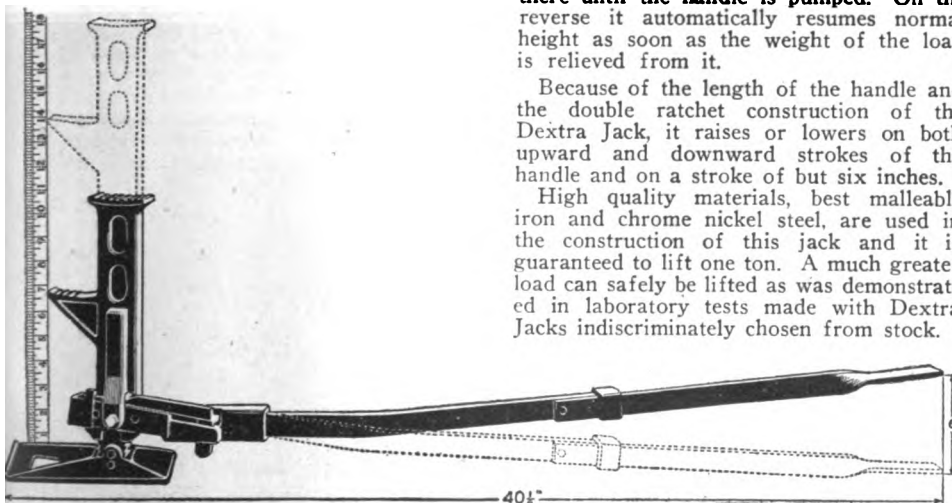
The chief merits of the tool are the



speed that is possible in removing pins, and the ability to reach pins in places difficult of access. It is not necessary to straighten the ends or legs of a pin before using the puller. The lifting point is merely hooked in the hole at the head of the pin, and the two handles of the puller squeezed together. The leverage permits of easily pulling the pin out of the hole.

It is stated that the average pull required to remove a $\frac{1}{8}$ inch cotter pin, the legs of which have been spread, is between 150 and 200 lb. This pull is sufficient in itself to straighten the legs. In order that the tool may have sufficient strength for removing the pins, each one is tested to withstand a pull on the point of 400 pounds. The motion of the movable or lifting point is about one inch.

The lifting point is made of tool steel, hardened and drawn. The two handles or lever bars are made of $\frac{3}{32}$ -inch sheet steel formed to shape and then casehardened. The parts are riveted together. The end of one bar is drawn flat and shaped to a screwdriver point. It is thus of use in spreading the ends or legs of cotter pins after they have been put back in place in the bolts. This tool can also be used for removing wire staples and similar articles.

**American Felt Company Announcement**

Announcement is made by the American Felt Company that its Felt Cutting Shop at 1915 Fort Street, Detroit, will be opened and in operation April 15th, the principal offices of this concern being located in New York, Boston and Chicago.

The Dextra Jack

The new Dextra Jack, manufactured by the Dextra Manufacturing Company, of 4864 Woodward Avenue, Detroit, appears to have every conceivable feature that the motorist might demand.

The experienced motorist rarely depends on the tools furnished with a car and he proceeds to equip his new automobile with a set of dependable tools.

It was by endeavoring to meet the exacting requirements of the experienced and practical motorist that the Dextra Jack was developed. There are close to twenty distinctive features, each almost equally important, that distinguish this Jack. Perhaps the most unusual feature is that it can be used under any make of car. This is the result of the jack being built so low. It has an overall height of eleven inches which raises to eighteen inches and it also has a "side lift" seven inches high that raises to fourteen inches. No matter how low the car is built the Dextra Jack can be used under either gas tank or bumper.

A long handle, thirty-two inches in length, that folds up to eighteen inches, for storage in the tool box, enables the person to use the jack from some distance from the axle. In designing the base the hydroplane theory was used so that the jack could be slid under the car without lifting by the handle.

The base is big and wide and will slide under on mud road as easily as on pavement. On soft or muddy surfaces this big base gives ample support without the aid of a plank. With the ordinary jack the user has to get down and reach under to throw the little lever that operates the reverse but with this new Dextra Jack the reverse trigger is operated by the handle. If it weren't for having to move to change a tire the jack operator could stand in one spot and raise and lower the car.

After the jack is in place and ready to use it does not have to be pumped up to the lifting point. It can be lifted by the handle to the load and it automatically locks there until the handle is pumped. On the reverse it automatically resumes normal height as soon as the weight of the load is relieved from it.

Because of the length of the handle and the double ratchet construction of the Dextra Jack, it raises or lowers on both upward and downward strokes of the handle and on a stroke of but six inches.

High quality materials, best malleable iron and chrome nickel steel, are used in the construction of this jack and it is guaranteed to lift one ton. A much greater load can safely be lifted as was demonstrated in laboratory tests made with Dextra Jacks indiscriminately chosen from stock.

Marlin-Rockwell Announcement

The tax dispute of the Marlin-Rockwell Corporation with the Government has been adjusted and the taxes paid. The corporation's officers and directors state that the attitude of the Treasury Department has been fair and reasonable.

The future policy of the corporation will be to confine itself to the ball bearing business which it operates under the Standard Steel and Bearings Incorporated, of which it owns all of the stock, and the liquidation of those of its assets which are unnecessary to this industry.

The management states that the bearing manufacturing facilities of that company are the largest of any of the companies engaged in this business, (except the General Motors) and the newest and most modern.

The corporation's present business reflects the general revival in activity in the automotive industry which it serves.

Guy W. Vaughan, President and General Manager of the Standard Steel and Bearings Incorporated has been elected Vice-President of Marlin-Rockwell Corporation.

The Autoquip Valve Grinder

It is said that you can reseat or re-grind your motor valves in a few minutes, when you use the Autoquip Valve Grinder, shown in the cut. Previous experience or an expensive mechanic is not necessary.



The valves should be resealed each 3,000 miles of driving if you expect your motor to be full of pep, to function properly and save your Gasoline.

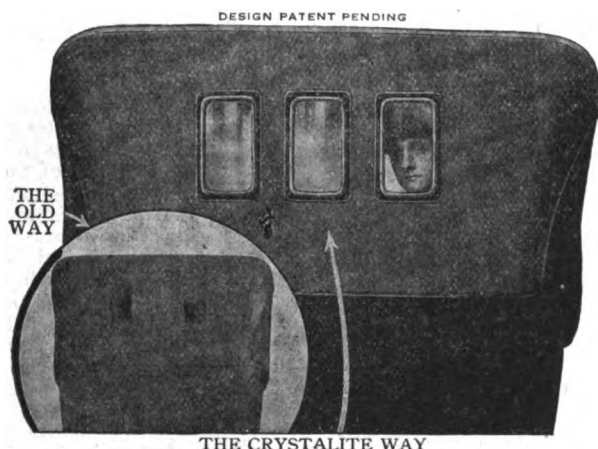
When valves do not seat properly the gas vapor which enters the cylinder for firing escapes through your valves into the exhaust manifold, where it usually explodes—sometimes not until it reaches the muffler. This is one cause of so much back-firing.

A simple rack and gear mechanical movement performs a five-eighths reciprocating motion, by the continuous turning of crank, giving a free movement, no jerk or jar—with the spring telescoped in the valve stem the manufacturers claim that they obtain the same tension on the valve seat at all times, making it possible to grind valves in one-tenth the time ordinarily consumed. It is very valuable for private owner as well as repairman. The device is finished in black and nickel and additional bits are furnished to engage the various types of valves.

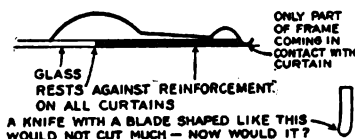
The construction is so substantial that the tool is guaranteed to last a life-time with ordinary use. Write for prices and particulars to the manufacturers, Autoquip Mfg. Co., 493 St. Paul St., Rochester, N. Y.

"Crystalites" Rear Curtain Lights for Fords

The illustration gives some idea of the neat appearance of the Crystalites super improved rear curtain lights for Ford cars. These are manufactured by Haines & Co., 94 South Ave., Rochester, N. Y. As there has been some talk that metal frames for



putting glass in the rear curtains might cut the curtain, the manufacturers of these lights have spent a great deal of money and ingenuity to render this impossible (see sectional cut accompanying this article).



The "Crystalites" trade mark is registered and design patent on the curtain light is pending. Besides being so neat in appearance these curtain lights are made of finest quality durable material and will wear and look well indefinitely.

Dealers, garages and repair shops should stock up now for spring trade and write direct to the manufacturers for prices and discounts.

Laco Piston Ring

Instant reduction of friction, with just the result the motorist desires to make motoring a real joy at all times, is the work said to be accomplished by the "Laco" Piston Ring, according to the Locomotive Appliance Company, Toledo, Ohio, manufacturers of "Laco" Piston Rings.

Originally developed for use in a locomotive throttle valve, where one ring is required to seal 200 pounds standing pressure of dry steam without oil, the "Laco" Piston Ring has been perfected to meet the most exacting requirements of motorists.

With "Laco" piston rings, it is said that the seat line is absolutely unbroken at all times throughout the use of a diagonal-cut ring within a step-cut ring with openings opposite each other, absolutely preventing the passage of compressed gas. Both oil and gas strike a tight wall. Because of the flexibility of "Laco" rings, it is said they seat themselves to the cylinder wall even if out of round and continue to hold compression indefinitely.

As a sure indication of the confidence of the manufacturers in the efficiency of "Laco" piston rings, a full money-back guarantee comes with each order.

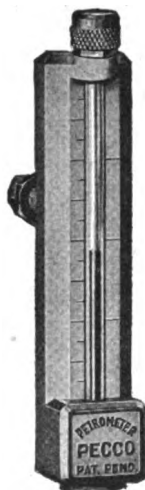
The Petrometer Indicator

The Porter Electric Carburetor, Inc., Knickerbocker Bldg., 42nd St. and Broadway, New York City, is manufacturing a gasoline indicator which is being sold under the trade name of the "Petrometer."

The Petrometer is a complete system for indicating the amount of fuel in the tank

and consists of a gauge, mounted on the instrument board, a tube inserted in the top of the gasoline tank and running through to the bottom and a thin hollow wire connecting the two. It has no moving parts.

The tube in the indicator contains a red fluid which indicates by its different levels the quantity of fuel in the tank. The makers claim that the actual position of the tank on the car makes no difference to the readings of the gauge and the system is applicable to all motor vehicles or other fuel or liquid tanks which are open to the air.



Multibestos Elects New Officers

At the annual meeting of the stockholders of the Multibestos Company, Walpole, Mass., makers of Multibestos Brake Lining and Multibestos Clutch Linings, Mr. C. W. Bunker was elected Treasurer of the company.

The officers and executives of the company are now as follows:

Stoughton Bell, President.
C. W. Bunker, Treasurer and Assistant to the President.
T. J. Daley, Secretary.
T. H. Bateson, Superintendent.
E. C. Miner, Ass't Sales Manager.
J. Posternock, Purchasing Agent.

The Handee-Lite

We illustrate here the Clark Extension Reel Light, known as the "Handee-Lite"—trade-mark name. This light, which has been formally passed upon by the Board of Fire Underwriters and meets with their full approval, is one of the handiest devices ever brought out for garages, machine shops, repair shops, battery service stations, store-cellars, stock rooms, or in any place requiring an extension light. It saves cord, lamps, sockets, fines and the time of high-priced employees and eliminates the danger of tripping over greasy cords, also prevents fire-risks from short circuit.

The Handee-Lite carries 24 feet of reinforced cord, giving plenty of range for work. The device is simplicity itself, easily installed on side-wall or ceiling. It holds light at desired height, lowered or raised instantly and automatically. The reel is eight inches in diameter, three inches thick and weighs nine pounds. The manufacturers guarantee every reel, as all are rigidly tested and inspected before leaving the factory.

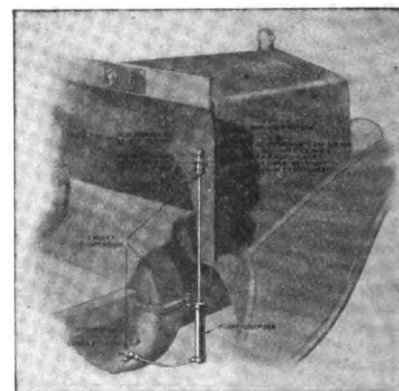


Very liberal discounts are offered to garages, dealers, jobbers and factories. All inquiries should be addressed to James Fitt Machine Co. Inc., 116 Congress Ave., Rochester, N. Y.

Reliance Radio-Light Oil Gauge

That there is a demand for Oil Gauges for the Ford Car is quite apparent by the many Oil Gauges which have recently been placed on the market but the Reliance Automotive Devices, Inc., 243 West 55th Street, New York have designed one which they claim will accurately indicate the oil level with the greatest convenience to the driver.

The Reliance Radio-light Oil Gauge, as the name implies, is as serviceable at night as by day, the upper and lower petcock levels as well as the indicator button being marked with radium. A great deal of the dread of night driving is thus obviated. Readers who will note the cut will see how the Gauge is mounted on the dash making it unnecessary for the driver to leave his seat or stop his car.



Vanderpool 1922 Five Cavity Vulcanizer

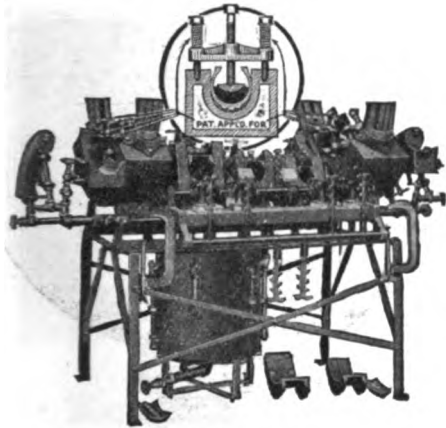
This sectional view illustrates the patented improved Vanderpool Springs on the Vanderpool 1922 five cavity vulcanizer.

These springs are said to eliminate the danger of separation and blister, and do a perfect job of retreading and section repairing, because they are continually

of leather used is guaranteed by the manufacturers not to get soft and soggy.

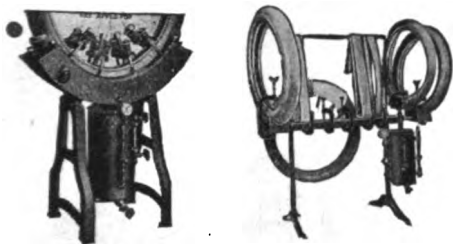
It is made endless with special cement, prepared by their own chemists and guaranteed not to open at the lap under any condition. This cement is water, grease, oil and heat proof.

They claim that there is nothing to unravel, rot out, come apart, or become tangled in the fan and guarantee it to outwear any fabric, rubber or sewed leather belt.



forcing the rubber into the molds as fast as it softens, automatically giving the proper pressure. This is claimed to be much better than the uncertain and time-wasting method of continually tightening bolts.

Sand and air bags are used in section molds and sand bags in retread molds with Vanderpool patent springs that compress 4000 pound in the section molds and 8000



pounds in the retread molds. This constant and even pressure not only guarantees the best possible work but also permits the use of sand bags on most jobs which is quite a saving over air-bags and will in time pay for the machine itself.

Nine tires and five tubes can be repaired and retreaded at one time, which easily explains the financial success of its many users.

Another practical feature that appeals to tire repairmen is the speed with which steam can be gotten up for a quick job. Steam can be shut off of all or any parts of the machine. Vulcanizers are made in all sizes to equip the smallest or largest shop.

The Vanderpool Company have been making Vulcanizers since 1912 and will send to anyone interested, an illustrated instruction book. Address Vanderpool Vulcanizer Co., Department A-4 E., Springfield, Ohio.

Victor Leather Fan Belt

The Victor Leather Fan Belt manufactured by the Victor Sales Company, 6532 Euclid Ave., Cleveland, Ohio, is made from first quality transmission belting leather tanned and stretched especially for transmission belting use.

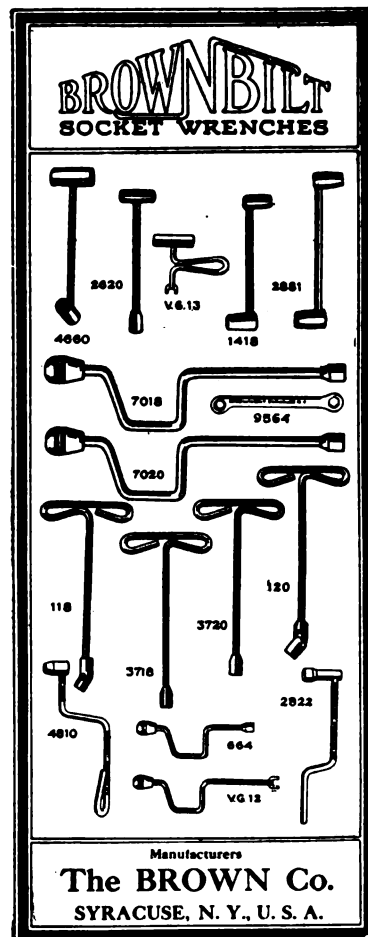
It is claimed that no trouble would be encountered by belt getting too long; no noticeable degree of stretch to belt, regardless of excessive wear and tear. The grade

Brownbilt Socket Wrenches for the Ford

There is an old saying that "Goods well displayed are half sold" and that is why the Brown Company of Syracuse, makers of the well known "Brownbilt" socket wrenches, is furnishing dealers with the neat display and stock board shown in the cut, on which are displayed the wrenches for the Ford car, comprising Set Number 300.

The set consists of 16 different wrenches conveniently made to fit every bolt and nut on the Ford. To the dealer ordering six of these sets, a total of 96 wrenches, the display board is furnished free. Every accessory dealer, garage or repair-shop proprietor who sell supplies to Ford owners, should carry these Ford wrench sets in stock.

The Brown Co. also makes a large line of wrenches for other makes besides the Ford and a particularly useful "All-Service Garage Set" which is illustrated this month in our advertising columns. Write for prices and trade discounts to The Brown Co., 218 Bellevue Ave., Syracuse, N. Y.

**Everybody's Hawkeye Basket Refrigerator**

Motor tourists and family picnickers are going to welcome the new "Everybody's Hawkeye Basket Refrigerator."

Is built like a high-class refrigerator. The outside is rattan, next to this there are several layers of the best insulating material, and it is lined with tin plate with removable ice compartment. A small piece of ice keeps contents cool for 24 hours.



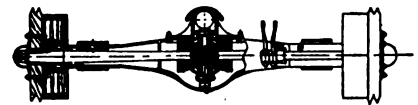
This basket is 20 inches long, 12 inches wide and 10 inches deep—light, neat, and durable, and shaped so that it can be placed under the robe rail in the tonneau of a car where it takes up little room and is within easy reach.

As it has an ice compartment which will hold ice to keep food cold, this feature will appeal especially to families who must take along milk for the baby and keep it sweet and sanitary.

This Basket Refrigerator is dust and dirt proof and keeps out insects. Its extremely low price has been made possible on this model only by the large manufacturing facilities of the Burlington Basket Co., 1005 Hawkeye Building, Burlington, Ia.

National Worm Drive Axle

We illustrate herewith the National Worm Drive Axle which is made by the National Axle Co., of Benton Harbor, Michigan, with sales office at 140 S. Dearborn St., Chicago, Ill.



The driving shafts in this axle are drop forgings of alloy steel, heat treated and ground to proportion aiming at a uniform stress throughout. The housing is of one piece, machine molded and said to be free from blow holes and shrinkage cracks.

The worm and worm wheel are accurately fitted by a special machine which makes them interchangeable with new ones. The worm is of alloy steel while the worm wheel is of alloy steel-bronze.

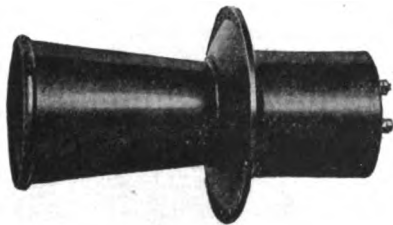
The differential is of the four-pinion type with drop forged gears and spiders. Timken Roller bearings are used throughout. Each axle is equipped with two pairs of internal expanding brakes.

National axles may be had in a number of gear ratios to suit the size of truck they are to be used upon.

The Besco Horn

An entirely new development in the line of electric motor driven horns has been placed on the market by the Briggs & Stratton Co., Milwaukee, long known as the largest manufacturers of automobile switches in the world.

It is claimed by the manufacturers that the numerous innovations in design embodied in this horn are responsible for the very attractive selling price placed on this



high grade horn which should make it a very popular accessory for the dealer.

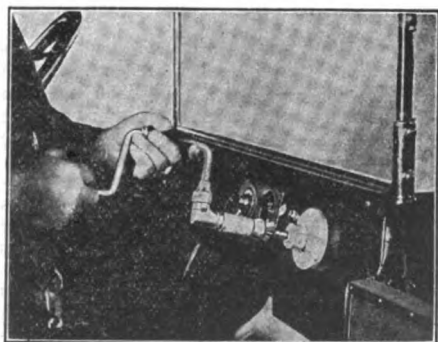
The motor unit presents quite a different appearance from the conventional horn motor design. The first impression is the very marked simplicity of design and small number of parts constituting it. Among the noteworthy features are oilless bearings and an entirely new type of brush holder construction. No lubrication of any kind being required, the troubles due to oil and grease or lack of them which are so often the cause of horn failures, are claimed to be entirely eliminated. It is impossible, the manufacturers state, for the brushes to stick.

The Basco Horn is equipped with a very high torque motor which insures instant response to the horn button and gives a very penetrating warning. External tone adjustment is provided.

Another important feature is that the entire horn which consists only of five units can be entirely taken apart and put together in five minutes and no tools are necessary but a wrench, as it is only necessary to remove two nuts.

The Misener Rotary Hack Saw

We illustrate herewith the Misener Rotary Hack Saw—an exceedingly handy and efficient tool for garage men and auto-repair shop mechanics. It is a well known fact that to cut large round holes in metals or other materials that have already been assembled is a very difficult job. This tool, it is said, does the trick. It will save all the drilling, filing and reaming that is ordinarily done on work of this character. When the Misener has cut through, the work is done and a perfect round hole is



the result that requires no finishing. It is claimed that a three-inch hole can be cut with this tool in about ten per cent of the

time required by other ordinary methods.

This invention is a wonderful labor and money saver when used for cutting holes for the installation of speedometers and other instruments. By grinding worn blades to a knife edge, an ideal gasket cutter is available.

The Misener Rotary Hack Saw will save its cost in one day's work and often on a single job and it should be in every toolkit. For illustrated circular and prices address the sole distributor, Robert M. Irving, 418 Gurney Building, Syracuse, N. Y.

Big Reduction in Spring Cover Prices

The Woodworth Specialties Co. of Binghamton, N. Y., who manufacture the Woodworth Lubricating Spring Covers, announce a 50% reduction in the prices of Spring Covers, making the cost much lower than even pre-war prices. This reduction in price is made possible partly by the lower prices for labor and material and partly by the improved construction in manufacturing facilities which makes it possible to turn out the covers in large quantities of certain standard sizes instead of making each cover separately, as is generally done.

The covers are now being made with an oil cup for replenishing the oil, so that it is a very easy matter to keep the felt pad always saturated and thus keep the springs perfectly lubricated. The Woodworth Spring Covers completely enclose the springs from the clamps at the thick part to the eyes at the thin ends. They have a felt lining which is kept saturated with oil, so that they not only keep the springs perfectly clean but also keep them perfectly lubricated.

They are made in two grades: an imitation leather and a genuine leather. The imitation leather is made of strong cotton backing with a cellulose coating that is said to be proof against the action of oil and water. The genuine leather covers are made of a fine quality grain leather of a very rich appearance.

The covers are said not only to make the car ride very easily but on account of making the springs very sensitive they absorb shocks and vibrations, so relieving the tires and machinery of a great deal of strain, and prolonging their life enough to save many times the cost of the covers.

The manufacturers will be pleased to send complete price lists on request.

Pressurite Gauges

We desire to call special attention to the excellent line of gauges marketed under the trade name "Pressurite" and manufactured by the Improved Gauge Manufacturing Co., 105 Canal St., Syracuse, N. Y. The line includes tire gauges, concentric gauges, control indicators, and spring oilers.

The gauge here illustrated is made in two inch and 2½ inch sizes for steam or air, and is especially adapted for garage use.

The gauge is finished in brass, nickel or japan and shows pressure from 30 to 300 pounds. The movement of the gauge, which is patented, is very simple, having only three movable parts. It is less expensive than the full circle gauge and is said to answer the same purpose, registering pressure instantly and with absolute accuracy.

The products of the Improved Gauge Mfg. Co. are already widely known and

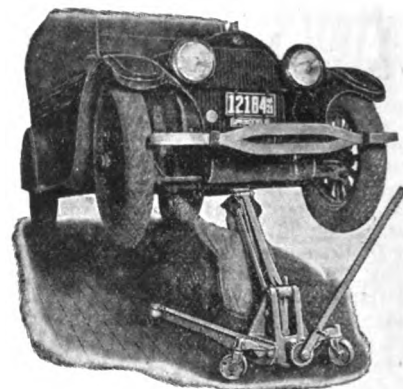
used, but a broader distribution is desired and correspondence from readers of this magazine in regard to handling the line is invited. Liberal trade discounts are offered.



The Weaver Hi-Lift Jack

The new Weaver Hi-Lift jack, illustrated herewith, which is being manufactured by the Weaver Mfg. Co. of Springfield, Ill., should be interesting to our readers because of the great variety of uses it can be put to.

The device is so designed that the extremely wide range of lift enables the mechanic to work comfortably under the passenger car or truck. The saddle of the



jack can be lowered to a minimum height of seven inches, sufficiently low to be applied to the lowest axle, and raised to a maximum height of thirty-eight inches. If a greater height than thirty-eight inches is desired, the removable standard with which the jack is equipped is used, fitting into a slot in the saddle and providing an additional height up to seven inches, or 45 inches in all.

It would be to the advantage of readers to get more complete information on the Hi-Lift jack and we believe that they would also find the Weaver catalogue F on garage and shop equipment of great value.

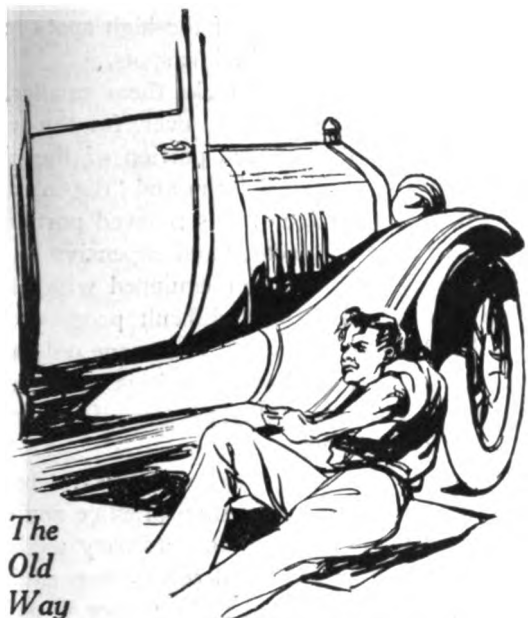
The Weaver factories at Springfield, Ill., and at Chatham, Ontario, Canada, are the largest in the world exclusively devoted to garage equipment, and in their newest device the experience they have had in this line is very apparent in the fine workmanship and in the sturdy materials used.

No More Crawling Under Your FORD

Oil Adjusted From Driver's Seat

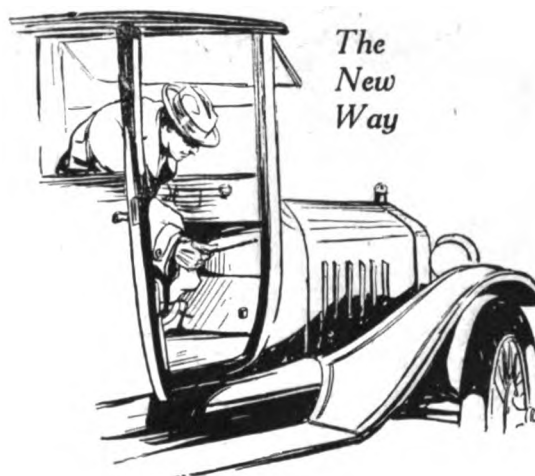
NO DIRT or GREASE

NO TROUBLE



*The
Old
Way*

With
**Schaefer
OIL
WATCH**



*The
New
Way*

ELIMINATE THIS

FOOL-PROOF and HANDY

FORD DEALERS everywhere greet Schaefer Oil Gauge with great enthusiasm. They appreciate its acceptance by the Ford owner as his best assurance against Burned Out Bearings; and as a reducer of expenses, a sure eliminator of trouble and a good preserver of clean clothes. It has many appeals for the Ford owner and these are but a few of the numerous reasons why Schaefer Oil Gauges sell themselves.

ALL OIL TROUBLE ELIMINATED

The Ford owner usually guesses at his oil supply. He just hates to creep under his car with a pair of pliers, twist open the two pet cocks to find out how the oil supply stands. He relies upon guess work and guess work is usually wrong. The result is burnt out bearings and cylinders full of carbon. Show him Schaefer's Oil Gauge which will eliminate all troubles; show him how simple it will be to unscrew the rod from the toe board, lift it up and see at a glance whether his oil is at the

proper level or not. No stepping out of car. No creeping under it. No dirty work and no more oil trouble—the full facts in a few seconds.

EASILY INSTALLED

Installing the Schaefer is so simple that he can do it himself. Simply attach it to the crank case in place of the lower pet cock, bring it up through the toe board and everything is set. No further trouble with oil supplies will be experienced.

ABSOLUTELY ACCURATE

There is no complicated arrangement which can get out of order and mislead him. What is read on the rod is the exact amount of oil in the crank case. The Schaefer Oil Gauge cannot lie because there is absolutely nothing which can get out of order.

DEALERS: You will want to carry Schaefer Oil Gauges in stock so that you will have them when asked for. They retail for only \$2.50. (Write for particulars about our attractive dealer proposition.)

Mail This Coupon Today

Philip Schaefer & Company

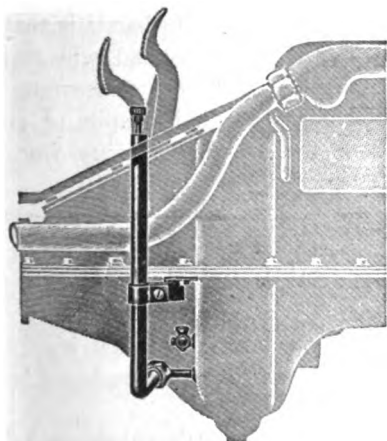
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Are Your Top and Side Curtains Ready for Spring Or are they Gray and Dirty from Frost and Wear?

With Johnson's Black-Lac you, yourself, can easily and quickly make your top and side curtains look like new. No experience required—all you need is a brush and an hour's time. It gives perfect satisfaction on any kind of a top—leather, imitation leather or mohair. One coat imparts a rich, black surface just like new.

JOHNSON'S BLACK-LAC

The Perfect Top Dressing

Johnson's Black-Lac is easy to apply—you can do it yourself—in less than an hour. It dries in fifteen minutes and will not rub off on the hands or clothing. It is permanent, waterproof and inexpensive. It acts as a preservative for the finest leather, making all kinds of top material soft and flexible.

Keep Your Car Young—Free Book Tells How

Write for our free book on Keeping Cars Young. Tells how to make your car look like new—remove carbon yourself—mend radiator leaks—lubricate springs—remove spots, tar and alkali—revarnish your car—grind valves and mend your own tubes. Mention the name of your accessory dealer.

S. C. JOHNSON & SON
Racine Dept. AD-5 Wisconsin

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Eliminates Present Cost of Fitting Comebacks

"The cylinders are bored to fit the pistons, eliminating nearly all hand operations such as filing, turning, lapping-in, etc., giving an absolutely uniform job every time. Only a slight amount of hand filing to remove the high spots and niches is required. Pistons fitted by this process to 2/100ths clearance are absolutely free in the cylinder and without rings or oil on them will "fall through."

"Lapping-in will cut off some of the high spots in the cylinders, but it will not fill up the low spots.

"Filing pistons in a lathe will make them smaller, but throw them out of round more than ever, for the reason that when the file hits the relieved portion of the piston near the piston pin boss, it will jump and "dig-in" again about one inch from the edge of this relieved portion.

"Lathe turning is unsatisfactory and expensive because the average service station is not equipped with proper tools for this work, and it is a difficult proposition to 'chuck up' a Ford piston accurately to remove only a few thousandths. These parts show why it is necessary to bore the cylinder accurately in the first place if you want a first class job at a minimum cost.

"Our main object has been to show you how factory methods can be applied to repair shop practice and complicated operation made easy for the ordinary mechanic. You can readily see how any Ford repair shop equipped with efficient tools can't help but make money if they do it well."

QUITE NATURAL

"Strange," murmured the magazine editor, "that this anecdote about Lincoln in his early days has never been in print before."

"It isn't strange at all," returned the contributor with some indignation. "I just thought it up last night."

—*American Legion Weekly.*

THE PARAGON

The reason there are so few good husbands is that the test is so severe. A really good husband will register something which looks like genuine grief on learning that the household's favorite fern has died in spite of everything that could be done for it.—*Kansas City Star.*

SHEER LUCK

PAT: Say, Mike, did yez hear about that big fiddler dying? He thought so much of his violin he had it buried with him.

MIKE: No, yez don't mane it? It's a dom good thing he didn't play the piano.—*Life.*

Locking Nuts

(Continued from Page 48)

Sufficient washers should then be applied between the nut and the cap to bring the slots in the nut opposite the cotter pin hole. If this is not done the nut is sure to slacken off and the adjustment will be lost.

The writer has seen a number of instances where washers were not used in a case like this, or where an insufficient number were applied so that the nut slacked up enough to spoil the perfect bearing adjustment.

Quite often a careless mechanic will be satisfied if he can get the slot in the nut to register sufficiently well with the hole in the bolt so one leg of the cotter pin can be passed through. Obviously this gives only half the security obtained when the whole pin is used and there is much more likelihood of the pin sheering off and releasing the nut altogether, in which case the connecting rod may come loose from the crankshaft and seriously damage the crank case.

It is often slow, tedious work to properly lock a cast-tilled nut and it may be necessary to remove it several times before the correct number of washers is found to bring the hole and slot opposite to each other. Sometimes it is necessary to file down one of the washers before the desired results are obtained. When it is difficult to insert a cotter pin it often will be found that the legs are slightly spread apart at the end.

This can be remedied by placing the lower end of the pin on some solid object such as a stone and tapping the head of the pin lightly with a hammer. This bows the legs out slightly at the center and closes the end of the pin.

Ordinary lock washers while satisfactory for securing nuts on some parts of the car are almost useless on other parts. Usually, if the manufacturer uses lock washers for locking nuts on certain parts of the car it is because they have been found to hold the nuts under the conditions imposed.

The chief advantage of lock washers is that they are easily and quickly applied. It is seldom advisable to use old lock washers a second time after the nuts have been removed. A lock washer to perform its function properly must possess considerable elasticity, and this is apt to be lost after the washer has been compressed for a long period of time. Also if the nut is taken on and off many times the washer is apt to crack in half. This may also occur if the nut is screwed down too hard. Lock washers are probably used the most for holding cap screws in place.

Lock nuts like lock washers appear to work very well in some places and not in others. The correct method of applying them is probably known to every mechanic. It consists of simply screwing the main nut down home and then holding it in this position with a wrench while the lock nut is screwed down on it so that the two nuts are jammed together.

The original one-way traffic is along the road paved with good intentions.—Life.

Investigate LATEST "WHITNEY" HIGH EFFICIENCY ROLLER AND SILENT TYPE CHAINS

also Low Cost per Thousand Miles of Service



LATEST ROLLER CHAINS HAVE
SPECIAL QUALITY SOLID ROLLS
AND OTHER IMPORTANT IM-
PROVEMENTS



Front End Motor
Chain Drives

EXCEPTIONAL MILEAGE
AND NEVER KNOWN
TO SKIP THE
SPROCKET TEETH

THE WHITNEY MFG. CO.
HARTFORD, CONNECTICUT, U. S. A.



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PISTONS

Established
**SIX NEW
WORLD RECORDS**

OFFICIAL A.A.A.

2000 miles 24 hrs. 53 min. 25 sec. 80.37 mph.
1928.75 miles 24 hrs. 88.36 mph.
1500 miles 18 hrs. 1 min. 42 1/2 sec. 83.24 mph.
1497.5 miles 18 hrs. 83.2 mph.
1002.5 miles 12 hrs. 83.54 mph.
1000 miles 11 hrs. 57 min. 57-45 sec. 83.57 mph.

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and Patented by
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CINCINNATI, O.

Branches
KANSAS CITY
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WEIGH LIGHTEST
FIT TIGHTEST

IN the endurance tests, speed trials and work-outs this car has traveled approximately 10,000 miles at speeds of 80 miles an hour or better. The wear-resisting qualities and endurance of Kant-Skore Pistons shown under these conditions are an indication of the service Kant-Skore Pistons are daily giving car owners throughout the country.

**REPAIRMEN
REGRINDERS
DEALERS**

BEFORE you stock pistons, write for literature and details of our liberal proposition. Immediate delivery on any size or oversize for all popular cars. New York, Chicago and other Motor Shows point to the universal adoption of Split Skirt Pistons.

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Automobile owners lists, any county in state, 1922 registration. Price \$2.50 per M. names and addresses. Buell's, Albany, N. Y.

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MAGNETO RECHARGERS for all magnetos.

Fords charged in car without removing bolts. Connects to any light socket, storage batteries or dry cells. Costs less than 5 cents to charge Ford magneto, or remove shorts. Test meter reads volts and amperes direct, makes complete electrical testing outfit. \$40.00 C. O. D. Distributors wanted. Benner Mfg. Co., Webb City, Mo.

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AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice of four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Formulas

New and latest Formula for Anti-Freeze Liquor for Auto Radiators—Cheap. Easy to mix. No chemical action on any metal. No action on Rubber Tubes. Very satisfactory in use. Costs less than 15 cents per gallon. My price, with directions, \$15.00. R. M. Glacken—The Chemist—Baltimore, Md.

Wanted

WANTED—Men with Ford cars to sell Stokes Carburetors. Exclusive territory given. Write for particulars. Stokes Carburetor Co., Inc., Good Ground, Long Island, N. Y.

AGENTS AND DEALERS to sell Victor guaranteed Spark Plugs. Quick sales. Liberal profits. Automobile Equipment Company, Dept. 10, Martinsburg, West Virginia.

Opportunities

Weezy—Squeezy—Springs soon break. Compton Spring Oilers prevent breakage by automatically lubricating spring leaves making smooth riding. Quickly attached without drilling or changing parts. Send \$4.00 complete set eight oilers; Special Ford Set \$2.00. County agents and wholesale distributors wanted. Box 14, Compton Company, 29 Broadway, New York.

Ford Starters

SIMPLEX STARTER FOR FORD \$20. Guarantee. Easily installed. Simple, Durable, Satisfy. Secure agency in your territory. Big profit selling them. American Simplex Co., Anderson, Indiana.

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PATENTS PROCURED AND TRADEMARKS REGISTERED—Eighteen years' experience. Instructions and Terms on request. Robb, Robb and Hill, Attorneys at Law, 888 McLachlen Bldg., Washington, D. C. 1340 Hanna Bldg., Cleveland, Ohio.

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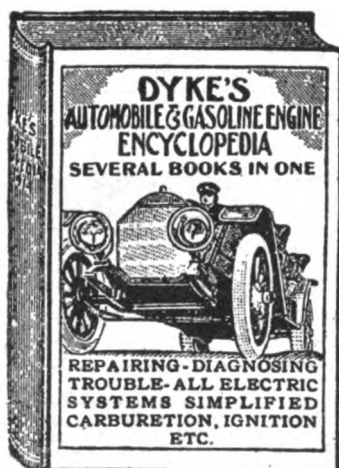
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Vol. 33, No. 3

MAY, 1922

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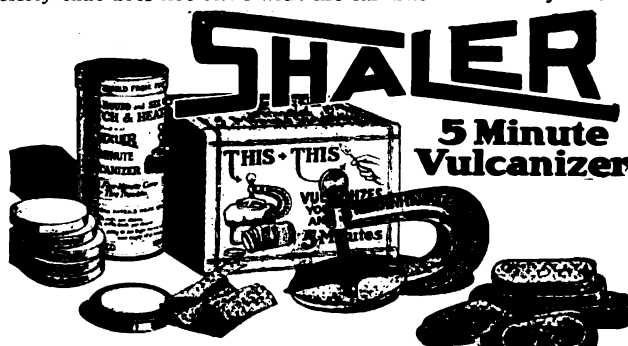
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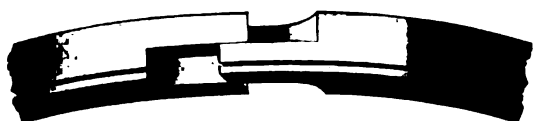


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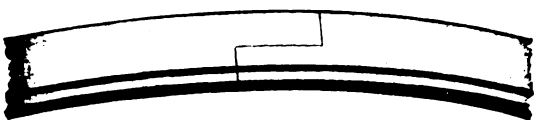
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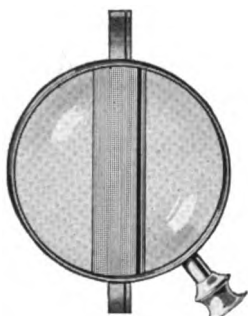
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The continuation of a Journey during the reign of Tarvia the Black

Foreword

B EING the further adventures of Hank Horntooter a resident of Rome (N. Y.) and Grezi, his neighbor who accompanies him, as he journeys from his abode to the far city of Athens in search of adventure. It was related in the previous chapter how passed the first day of their trip in their motor wagon, called the Bus, and what befell them at the abode of that great magician, the Garage. Hank and Grezi are setting forth on their second day's journey.

* * *

Chapter II

A ND they drove along the main highway; and Grezi sat uneasily upon the seat, and it came to pass that after they had been driving a short time, he reached beneath him and brought up a vessel of glass; and upon the vessel was an inscription in this wise; "Guaranteed Full Pint" and when he had smelled at the opening, he drew a full breath and smiled, and Hank said "Give us a whiff" and when he had whiffed as he had desired, he also smiled, but sadly withal as one who cherishes tender memories. But suddenly he drew up beside the curb and made haste to clambor out; and he had but only glanced about the bus than he yelled "Whaddyer know? looka this!" and Grezi also got himself down and upon a mud-guard was a long scratch which aforetime was not there; and they looked again and behold, a hub-cap was dented and as to the other mudguard, it was bent.

And Hank was wroth an spake with a loud voice, saying "Have I but just been robbed of ten bucks only to find that my bus hath been used by a bunch of besotted booze-fighters while I slept? I am going back and see that man" and he straightway turned about and went back.

And he desired to see the proprietor but he was out when he demanded the foreman, he had not come down; and he called aloud for some man to whom he might complain and they brought him the chief washer. And the washer spake unto him saying "Verily thou art a cheapskate," which, being interpreted, meaneth

a person of little worth" for I, even myself saw those marks when you drove in last eventide and as for the jar, belike thou hast forgotten and left it there; get thee gone or ever I ring for a cop" and he turned away from them. And Hank gazed at Grezi and Grezi at Hank and it was so that no words came to either of them.

But, after they had journeyed for yet a space, Grezi spake saying, "now wherefore go ye not to the police and tell to them what hath befallen you in that robber's den?" and Hank answered him, saying "lo! I am but a stranger in a strange land and the garage owner is a citizen here; moreover, he hath vassals without number, some of whom are guilty of this shame and how shall I prevail against so many?"

"I have ever found, dear Grezi, that it is best that I make no trouble in a strange place; moreover, that I have no traffic with the police, for they and their testimony are potent with the magistrates and the owner of a car fares but ill in their hands if he be a stranger."

"I did notice thy extreme polite manner when bawled out by the traffic cop" quoth Grezi, "and did marvel thereat." "Even so" answered Hank "such store of courtesy and urbanity as have been vouchsafed unto me, shall ever be used in my dealings with the traffic cops, for verily they be a power in the land, and if they say this man was driving forty, it maketh nothing if thy bus be a crab and skipping two cylinders, the magistrate saith "thutty bones" and it is either thy coin or the hoose-gow and, as for me, I like me neither."

Now it came to pass that, as they traveled along the street, they saw before them a bus, the action of which was peculiar, so that no man might know what it would do next; and Grezi proclaimed that it might be driven by a woman; and when they saw, behold it was even so and the woman constantly shifted her gears; and she would dart ahead and suddenly put on her brakes without reason and she would swing out to pass another and change her mind so that they were at much ado lest they bump her.

Hank spake, saying, "only the small half have ye told, Grezi, for that is not only a woman driver, but a fool woman driver; for there be as many kinds of women as men who drive; and when a woman drives well, as many do, I say unto you that she hath the majority of men skun a mile; but there be them who can never drive and should not be allowed out with a bus, and men be prone to judge all by them, forgetting the many maniacs there be among the men drivers who should rather be in custody than essaying to drive on the public ways."

And they journeyed until they came to open spaces;

and it was that the habitations of men were more scattered; and as they ambled along, there came unto them a sound like one saying "plop" and a small, round ball was found in the back of the bus. And they marvelled, thinking an enemy had shot at them; but presently two men in a field set up a shouting and waving their arms; and the men had weapons.

And Grezi backed up to the place where they heard the noise and the men came to them. One, speaking to the other saith "that is your lie, Fred, just as I had told you." But the other was wroth and spake saying "whaddaya mean my lie? can it be that ye consider that I shall get into this machine and drive from there?" "It is the rule" quoth the other "unless ye allow it be off the course" "but I tell ye my ball would have gone to the green had not this boat come into the way" I know not as to that" saith the first, "but I know the rules and so dost thou."

And more they said in heat and loudly; but Hank was concerned to know which of them was to pay for a hole in his curtain and when one had said that he left his money at the club house, the other settled, but with ill grace.

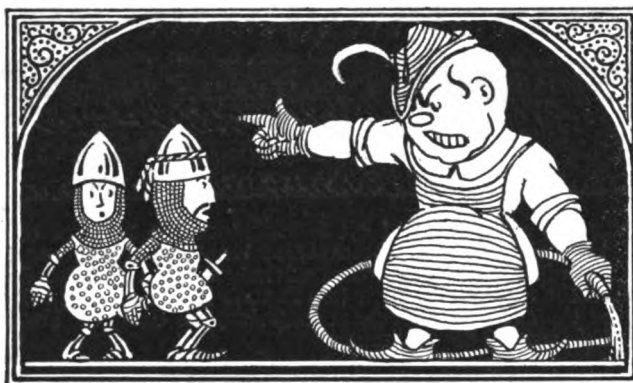
And when they had driven on, Grezi saith, "what manner of man are those who, going about the land with staves, do trouble the air with such language? can they be of the king's army? for I saw boys with them, bearing yet other weapons in case theirs be lost. "Nay" said Hank "those be afflicted with disease called golf, and golf is a game" quoth he.

But Grezi doubted and Hank made answer, saying

"this golf is from the Scotch." "That I can believe" said Grezi, "for I smelled the Scootch while they were talking, but why do they this thing?" "Some say it because their leech hath so ordered, some because others do likewise and some, they say, because they really like it" answered Hank "but a real golf-hound can no more tell why he acteth in such a manner, than an inmate of a mad-house can tell why he disturbeth other at times. The first lessons in this game show the victim how he may make holes in the sod with those clubs; these be called divots and he payeth the boy, who is named Caddie, in coin so that he may not give him

away, but he humoreth himself into thinking it is for replacing the sods.

After much of this, perchance he may hit the ball, as beginners do at times, and it goeth a short mile; then is the soul of him lifted up and he pranceth about and sayeth he has it now and desireth to play a match; but in sooth it is many days in which he is maced for many simoleons before he can sit with other wretches of his



"Get Thee Gone or I Get a Cop"



kind and be allowed to talk; he is yet to be the pray of the janitor, the professional and the caddies, but he can never forget that time he hit the ball; so he persevereth until, in fullness of time, he becometh what ye saw and speaketh largely of his handicap, Bogie, stances, putts, stymies, hazards, lies, both sandy and grazzy and many other things" "and what be they"? asked Grezi; they be even parts of the game, but I cannot tell how much they count" Hank made answer.

Now, by this time, they had come into the country so that they desired to return thereto; and Hank turned into a road on his right and when they had traveled seven parsangs, they came to one that appeared to lead them as they wished to go; and they came to a mile-post on which was inscribed Athens 12 M. and there was the likeness of a man's hand, pointing in the direction in which they were going. And Hank rejoiced and said it took Uncle Henry to show them the way.

But when they had driven yet a long way, behold! there was another mile-post and on it was Athens 14 M. yet the hand pointed even in the same direction; and Grezi looked at Hank sidewise and saw that he was troubled; and yet, further on they came upon one on which was Athens 11 M. but it seemed to be loose, and pointed into the air so that Grezi thought it was for the use of aeroplanes but Hank scorned him; and it came to pass that they overtook a woman of the country and inquired of her, but she said that John had gone to Town, so she could not tell; but naethless Hank continued to drive until lo! they began to see signs of habitations and, in fullness of time, they reached the main highway.

They had gone but a short distance into the City when they saw a crowd standing about two buses that had been in collision and they stopped and rubbered with the others; and one was a new and shiny bus; and a woman, standing by it's side, lifted up her voice and wept and said that they had just bought it and now, the owner of the other, which seemed to have known the roads for many years, claimed more damages than what the new car cost; and that the other had crossed the highway from a side road without sounding his horn and now they feared they would lose the bus.

"Is it that ye are insured?" asked Hank; "nay" the woman made answer, "we do not believe in insurance." "Hump!" said Hank and they drove on. And when Grezi inquired of Hank if he was insured. Hank made answer, saying "sure thing! verily I would not be without it; for, look you preadventure a dog rusheth out out and essayeth to bite my tires, and he loseth his footing

and I run over his paw; then cometh the owner straightway and sayeth it is a blooded dog and a pet of his children but, in such case it is for me but to say good sir, and this be a valuable dog as ye have said, take it up with the insurance company; but an it be a cur, as he doth appear to be, and thou wilt be content with five bucks, sign thou this receipt and take the coin.

"And it will often come to pass that there will be no more talk of blooded animals or pets, but the owner will cheerfully sign and pouch the spoil; for he knoweth better than to spin fairy stories in the ear of the adjuster. Moreover, the company serveth as a reference in case of accident if the peradventure a magistrate desireth to know if damages will be settled in case I am found in fault; and still moreover, no driver, albeit he is of many years experience and a careful man withal, can be sure that he will be free from accident; indeed, meseemeth it that the most careful be the most liable, even through over-care."

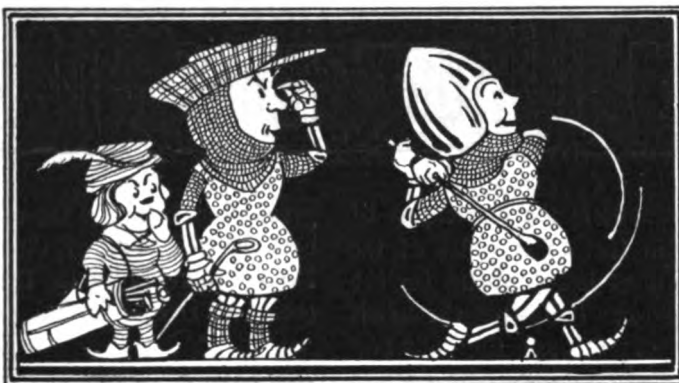
"But, assume that ye get before the Court" said Grezi. "Now Heaven forfend" said Hank "for, what saith the jury-man? lo! he saith, this gink hath scads or he would not own a bus; we will soak him; but the insurance man sitteth ever at my right hand and if so be I am soaked, he payeth the shot and as for me, I drive as aforetime and lose not my car."

Then there passed them a bus, the driver whereof carried a sad face and a woman, sitting on the back seat was anxiously in converse with him; and Grezi smiled and said "behold! there is one of your women drivers, Hank" "yea, even so" Hank made answer, "she driveth from the back seat and the man hath my sympathy; for no passenger

can tell a driver what to do or how to drive and it helpeth not, in a tight place to have women scream and say mercy! George what are you trying to do now? do be more careful! I am afraid for my life and I say unto you that such a one, and she would not be quieted, might either drive herself or get out and walk, for I would have none of it."

Now as they so conversed, there came a noise of shouting and a bus passed them at great speed and the shoutings were from the driver thereof; and he turned him about and beckoned unto them saying "Come on" and as he beckoned he missed a telephone pole by a hair.

"He is full of hooch" quoth Hank "and I am joyful that he passed us in safety; such as he, the hoosegow is too good for; no less than three years in the pen, on the rock-pile, where he may think while he maketh big ones into little ones, would be the meed of justice in his case; for neither his own, or the life of any man, woman, or child



"This Golf Be from the Scotch"



is safe when such a lunatic is on the road.

And it came to pass that, even then, they saw the bus piled up along the road and men bearing his form away; "Now, Heaven be thanked" said Grezi if so be it that he hath killed himself and no other."

And they came upon many machines, all going into the City; and soon all the others slowed down; and Hank also slowed, even so that he went not as fast as the others. "Why so sedate?" asked Grezi. And Hank, answering, said "note ye not that the others have slowed? verily, I say unto you there is hereabouts a trap" and even as he spoke Grezi saw the cop and he marvelled, saying "how wot ye that the trap was here? have ye been reading?" "Nay" answered Hank "but I did note that the local drivers slowed down and your local is a wise guy and knoweth the traps and can I do better than to do even as he doeth?"

And he told of his cousin who was driving behind a limousine so that he could not see ahead and the limousine slowed down and the cousin said "aha! here is where I get ahead" but when he had essayed so to do, lo! there was a cop who took his number and it cost him \$50.

And they passed through the City unto the other side

and came even into the country places; and they paused in the shade of a tall grove and Grezi, looking therein saw a great litter of papers and thought it belonged to a dealer in junk; but Hank, answering, said "nay, friend Grezi, these are the mark of them that picnic on the holy sabbath and at divers other times; for they have no gratitude toward him who owneth the grove that he putteth not a sign up against them to prevent them but leave their lunch-boxes and papers without caring to rid them up and the place hath become an eye-sore and will continue so to be until the long-suffering owner or his bondmen come and do what in common courtesy, the picnickers should have done. Will I allow them in my grove at home? not on yer life! for where there be one who picks up after himself there be nine who say "we should worry."

And they came to a place where many men labored upon the highway; and they saw a sign which read "Use This Road At Your Own Risk" and beneath "Passable But Unsafe" and Hank said that the signs were bull for no man or township might close a road without giving traffic warning to detour and that the public highway was not to be made, unsafe, but contrarywise.



ONE of the mistakes often made in the lubrication of the Ford rear axle, and in fact other axles of the same construction, is in the use of heavy grease for the purpose. The owner of an old car finds that the lubricant in the axle tends to leak out through the ends and gum up the brakes. Under such conditions he decides that a heavy grease will obviate the trouble.

Unfortunately the usage of heavy enough grease to prevent leakage will probably result in the damaging of the axle. The very fact that the grease leaks through the axle bearings shows that it is fulfilling its duty. All of the bearings must be lubricated and the openings to the bearings are small.

The holes into the differential housing where the differential pinions, spider and axle gears are located, are comparatively small and if the grease is too heavy it will tend to pack into lumps and will not find its way into the differential at all. With no lubrication the gears will soon be destroyed.

The best lubricant for Ford rear axles is a product called "non fluid oil" or "semi fluid grease." This lubricant is a stringy product which appears to be soft and almost liquid but when lifted on a stick will not run but "string out." There are many graphite lubricants on the market which come in the same class with the non fluid oils, they are soft to the touch but will not run.

If such oils as we mention will persist in leaking through the bearings to the brake bands do not use heavy

grease but install a set of felt washers and metal caps between the ends of the bearings and the wheel hub. Do not bore holes in the axle housing to allow the grease to escape for this is poor practice.

* * *

HOW do you solder gasoline tanks? Personally, we let the other fellow do it unless the tank can be left for several days during which it is emptied, aired, boiled out, and aired again. But we have seen men solder them right on the car. It looks risky. One popular method is to remove the tank and fill it with water; then the leak is turned to the top and soldering begun—it is argued against this method that what gas there is will collect and issue from the leak to be a risk when the hot iron is applied in proximity, but if the iron is kept at the lowest heat that will melt solder there is little chance of an explosion.

HARVEY BULL is one of the best plumbers in our town and as an auto mechanic he is more careful and intelligent than any I know of in garages. In his business he uses a 1915 Overland with delivery body on.

Four years ago he brought in his pistons and we reamed them .004" oversize for new wrist pins. We also made him four new pins .754" in diameter. He didn't want them drilled so they were made *solid*. Did the car knock from the unbalance? No, it has run as

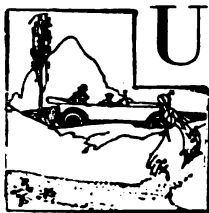
quietly as any Ford all these years and it has been doing yeoman service too. The pins were made of cold drawn steel, turned from thirteen-sixteenths inch stock, and casehardened in a forge fire for two hours.

Last month Harvey came around and had four new pins made .756" in diameter—"going to ream the pistons out and make these go four years too," he said. The original set had worn but .002" in all that time.

What About the New Car?

A Few Suggestions to the Owner Relative To Putting the New Machine in Running Order

By Edward F. Ingram



USUALLY the owner receives a new car from the dealer, in which case it has already been put in running order, but this is not always the case and so it will be well to start this discussion on getting the new car ready to run with the arrival of the car at the freight depot.

Right here the owner is warned not to sign the freight release until the car has been carefully inspected to see that no damage has been done en route.

The first operation in unloading the car is to remove the cover and binding blocks. It is necessary to push the car out of the freight car and freight depot and when this is being done someone should sit in the driver's seat who is familiar with driving. This person should steer the car and make use of the brakes to prevent it from gaining too much momentum when rolling down the incline from the freight car to the ground.

First Inspect Car Carefully

After the car has been thoroughly inspected to ascertain if any damage has been done, everything about the car, such as side curtains, curtain rods and tools should be checked up to make sure nothing is missing. In case any damage has been done or anything is missing, the owner should report it by making a notation on the receiving slip provided for same.

The next operation is to prepare the car to run. Attention should first be given to the battery and electrical connections. It is a good plan to remove the plugs from the battery cells and make sure that none of the electrolyte has been lost through spilling or evaporation. Usually the battery will be found in good condition, but if the electrolyte is below the top of the plates, enough distilled water should be added to cover them. The plugs should then be replaced and screwed down firmly. Usually the manufacturer leaves one of the battery terminals disconnected. In this case the wire should be connected to the terminal and the nut screwed up tight with a pair of pliers or a wrench. It is advisable then to look over the other electrical connections to make sure they are all right.

Attention can next be given to the radiator. After making sure that the drain cocks or plugs on the radiator and on the pump, if one is provided, are closed, the rad-

iator should be filled with clean, soft water. Usually the water from the city main will be satisfactory for this purpose, but rain water is better when it can be obtained.

Sometimes the water will back up momentarily due to air locks and give the impression that the radiator is full when it really is not. Care should, therefore, be taken to make sure that the radiator is really full before replacing the radiator cap.

If it is winter it will be advisable to use an anti-freezing solution in the radiator, otherwise it will be necessary to drain the cooling system, whenever the car is left standing outdoors or in an unheated building for a long enough period for there to be danger of freezing. Denatured alcohol is, undoubtedly, the best solution for this purpose, for it is harmless and comparatively cheap.

The only objections to alcohol are that it evaporates rather rapidly and boils below the boiling point of water. Glycerine will raise the boiling point and will not evaporate, but it has some action on the rubber hose connections and is quite expensive. The amount of alcohol which should be added will depend upon how cold it is, but usually about 20 to 25 per cent of the contents of the radiator will be sufficient.

The next step in getting the car ready to run is to fill the gasoline tank. The tank may, of course, be located under the cowl, under the front seat or at the rear of the car, the latter now being the most common position. The gasoline should be poured through a funnel having a chamois strainer to prevent any water and solid matter from passing into the tank.

Putting Fuel Into the System

Most cars are now provided with a gauge which registers the amount of fuel in the tank. When replacing the filler cover care should be taken to see that it is screwed down tight. This is especially important in the case of a car with a pressure feed gasoline system, but few cars are now provided with this type.

If the car is provided with a vacuum feed system it will be necessary to fill the vacuum tank which is usually located under the hood. This can be done by removing the plug in the top of the tank and pouring in the gasoline.

Another method which may usually be used to fill the

vacuum tank is to close the throttle and turn the engine over a few times by means of the starter. This will usually create sufficient vacuum to fill the tank. In some cars a special pump is provided on the dash for filling the vacuum tank.

After the vacuum tank has been filled it is advisable to examine the float chamber of the carburetor to see if the fuel has reached this point. Some carburetors are provided with a glass float chamber which makes this particularly easy to find out. The carburetor should have been properly adjusted before the car left the factory so that it is best not to tamper with the adjustments unless there is good reason to believe that they have been disturbed.

Lubrication Especially Important

Next comes the question of engine lubrication. Some manufacturers ship cars with the oil in the engine so that it is ready to run, but others do not, so it is necessary to examine the crankcase to see if it contains oil. Nearly all engines are now provided with an oil level gauge for showing the amount of oil in the crankcase, but it is best not to depend upon this gauge when receiving a new car as it may have become caught so as to indicate that there is oil in the crankcase when there really is not.

Petcocks are now provided on the crankcases of most engines and by turning these the owner may find out positively whether there is oil in the engine. When filling the engine it is best to use the make and grade of oil recommended by the manufacturer.

Attention should next be given to the tires. The tires should be inflated to the pressure recommended by the manufacturer, but in case these figures or a tire gauge are not available the tires may be inflated until there is no flattening when resting on the ground.

The car should now be in condition to start. The gear shift lever should be placed in the neutral position where it is free to move sideways, the start lever should be set at the fully retarded position and the throttle lever should be set about one-third of the way open.

If the weather is cold the carburetor air regulator should be set at the "choke" position. The operator should then turn on the electric switch and press the starter pedal all the way down. As soon as the engine starts, which should be after it has turned but a few revolutions, the starter pedal should be released at once, the air regulator should be set at or near the normal running position, the spark lever should be advanced, and the throttle lever should be closed to a point where the engine is running slowly and regularly.

Priming for Rich Mixture

It may be necessary to keep the air choke valve partly closed until the engine warms up, but the engine should never be run any great length of time with the air valve in the choke position as this gives an excessively rich mixture and uses an abnormal amount of gasoline. Also the very rich mixture results in some of the heavier less volatile portions of the fuel collecting in the

cylinders where it works past the pistons and dilutes the oil in the crankcase.

Pressing the starter pedal sets the electric starting motor in action and in many cars meshes the gears on the motor shaft with the teeth on the flywheel of the engine. If the starting motor pinion does not mesh with the flywheel gear when the starter pedal is pressed, the operator should not hold the pedal down but release it and after a few seconds' pause press the pedal down again.

If the engine does not start within about thirty seconds after the pedal has been pressed down, the pedal should be released and all controls examined to see if they are properly set. A second attempt should then be made to start the engine. In winter, when the engine is very cold, it is apt to require more cranking, but in ordinary weather it should start on the first few turns.

If the engine fails to start with reasonable promptness, the operator should not continue to hold the starter pedal down and keep the engine turning as this will run down the storage battery and the probability is that there is something wrong which is preventing the engine from starting.

Failure to Start

Failure to start in the case of a new car is usually due to a fault in either the gasoline or ignition systems. The carburetor should again be examined to make sure that it is receiving gasoline. If the gasoline is not flowing properly a valve may be turned off or the line may be obstructed with dirt. The latter trouble is not likely in a new car, but sometimes a bit of solder, for example, will be dropped into the tank or feed pipe and cause a stoppage.

If the gasoline system seems to be functioning properly, the operator should next turn his attention to the ignition system. He can ascertain if a spark is occurring at each plug by cranking the engine and placing the end of a screw driver between the metallic connection on top of the spark plug and the metal of the engine. If no spark occurs, the battery contacts should be examined to see if they are clean and tight. The ignition coil should also be examined to see if current is being delivered to this point. If the coil is functioning properly, the trouble is probably in the distributor rotor or in the spark plug wires.

If current is being received at the plugs the trouble may be due to broken spark plug porcelains or to the electrodes of the plugs being set too far apart or too close together. The distance between the points should be about $1/32$ in.

If the engine starts but fails to fire regularly the carburetor adjustments should be examined as already stated the carburetor should have been adjusted before the car left the factory, but sometimes the vibration from the railroad trip will throw it out of adjustment, though this is unusual. If the operator is not familiar with adjusting carburetors, he had better seek the services of one experienced in this work.

An air leak in the intake manifold due to it having be-

come loose will also cause irregular engine operation. Other causes may be faulty ignition, water in the gas-line or a valve sticking open. Trouble from the latter cause is not very likely in a new car, but may occur because of faulty workmanship.

Since attention has been given to the water and oil supply, trouble from overheating is not apt to be experienced. If overheating does occur, however, the cause may be a slipping fan belt, improper timing of the ignition or operating the car with the emergency brake set. These troubles will also cause lack of power.

Most cars now have detachable starting cranks, so if the engine has to be cranked by hand it is necessary to remove a cap situated below the radiator and push in the crank until the starting clutch is engaged. The engine should be turned by pulling up sharply on the crank. The operator should never start the engine by pushing down on the crank as a back-fire is likely to result in a broken arm. When it is necessary to turn the engine in order to test some part of the mechanism, care should be taken to see that the ignition switch is off.

A new car should never be driven very fast or forced on the hills as the engine is usually pretty stiff and there

is danger of burning out a bearing or doing some other damage. After the car has been run a few hundred miles the bearings will work in. Care should be taken at all times not to allow the engine to race at high speed without a load. The operator should never attempt to run the car by means of the self starter, even though it is possible to move the car a short distance in this way.

Sometimes an owner will start the engine when a car is stopped on a hill by taking off the brake, allowing the car to gain momentum and then letting in the clutch. This should never be done as it throws an abnormal load on the drive line when the clutch is engaged and is liable to do damage.

Some manufacturers ship an owner's record card with the car which should be filled out and returned to the manufacturer. On this card the owner is usually required to furnish the following information:

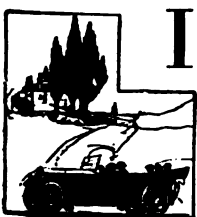
Car number, license number, owner's name, owner's address, rural free delivery number, nearest express office, nearest freight office, from whom the car was purchased and the date purchased.

If the car is equipped with a lock which is approved by the Underwriter's Laboratories, the owner is entitled to a special rate of insurance against theft.

Case Hardening of Steel

A Continuation of the Article Relative to
the Surface Hardening of Machine Parts

By J. F. Springer



IN the foregoing cases what is desired is a very hard wearing surface—a surface hard enough to resist the friction that occurs in service. It can often be gotten by the simple procedure of converting the outside skin into a high-carbon, tool steel, and then heating and quenching it. In this way, a very hard surface may be provided.

In fact, the result will probably often be superior to what would be obtained if the whole article were made of tool steel.

This may need explanations. Consider the case of the gear wheel. If this gear were made of solid tool steel, the carbon content would probably not be over 1.00 or 1.10 per cent. But, if a case-hardening process is carried out on mild steel, the outer skin can be made contain as much as 1.20 or 1.50 per cent of carbon. Upon heating and hardening, we should expect to get a much harder surface from the steel containing only 1.00 or 1.10 per cent. Similarly with the spindle. In short, there are probably very many cases where, if the article is to be made of solid tool steel, we should not venture to use a steel of excessively high carbon content. But, if we are case-hardening mild steel, we shall often be

ready to make the outside skin of very high carbon and get a very hard wearing surface.

All this leads us to expect that at times we can do better to case-harden mild steel than to use solid tool steel. At any rate, manufacturers case-harden soft steels and do a great deal of it.

Re-heating Case Hardened Parts

When a case-hardened gear wheel or spindle comes into a repair shop and is there heated up for any purpose, two things are more or less likely to take place.

(1) The hardness produced by heating and quenching will certainly be lost; and (2) the high carbon content of the surface will probably be reduced. In short, in many cases, the skin of high carbon tool steel will become a steel containing less carbon. Whenever this occurs, we cannot expect the gear or the spindle to get back all its old hardness when it is duly heated and quenched. In other words, in order to complete the repair, it will be necessary to give the gear a case-hardening treatment.

The machinist has his choice of two methods—(1) one of which uses potassium cyanide, and (2) the other of which employs a furnace, a box, and packing material.

The method which depends upon potassium cyanide produces only a very thin coating of high carbon steel; but this thin coating seems to contain relatively a good deal of carbon. That is, by this procedure an exceedingly hard but very thin skin may be gotten.

There are two varieties of procedure.

Potassium Cyanide Method

(1) Where the article is immersed in a bath of liquid potassium cyanide.

(2) Where the surface of the article is sprinkled with a sticky mixture containing a hardening preparation of the potassium cyanide sort. The article is heated to the proper temperature.

Procedure No. 1 is to be regarded as usually the better one to use. "The first or 'immersion' process is by far the most efficient, both as to uniformity of the carburized zone, and simplicity and uniformity of operation. Further, this first method has the tendency to reduce deformation and oxidation during heating and quenching, since, as previously explained, heating in any molten bath has this effect"—D. K. Bullens, *Steel and Its Heat Treatment* (1918), pp. 246, 247.

Temperature of Cyanide

The potassium cyanide is to be melted in a suitable pot-furnace and the temperature is then kept pretty steadily at a point about 1550° to 1600° F. This temperature will be suitable for ordinary *machinery steel*. The article is put into this bath and kept there until it is heated through and through to the temperature of the bath. "This heating may be somewhat prolonged in order to obtain a greater depth of skin. In general, however, it is not advisable to heat for a length of time much greater than ten or fifteen minutes," or at very high temperatures, "since such heating will tend to give non-uniform and high-carbon zones which, after quenching, are intensely brittle and may chip off in service."

With some, a slight variation is followed. That is, they put the article into the potassium cyanide as soon as it melts and heat steel and bath up together until the proper temperature has been reached. There seems to be some advantage in this, as then the article gets a thoroughly good chance to get uniformly heated everywhere.

The Time for Quenching

When the proper temperature has been reached, the article may be quenched. It is permissible (as already indicated when explaining the method where the article is not put in until the temperature of 1550° or 1600° is attained) to prolong the heating somewhat and then quench.

The quenching is properly done in *lime water*—that is, in water containing lime. The object is using lime is that the lime shall neutralize the potassium cyanide that may be left on the steel.

"It is absolutely necessary to remember that cyanogen compounds [these include potassium cyanide] are deadly poisons, and every precaution should be adopted when using them. Furnaces should be supplied with hoods

which have strong draft. Gloves should be used in handling all work, for if [potassium] cyanide gets into a fresh cut or scratch it will prove deadly. In some cases when working at the furnaces, it is even advisable to use face masks, and to cover up any exposed parts of the body."

Other Procedures

The work may be heated up, say, to 1575° F. The potassium cyanide may now be sprinkled upon it; or else the work is plunged into the potassium cyanide. In either case, the heated steel is again heated up to 1550° or 1600° until the potassium cyanide melts. When this takes place, the article constituting the work is plunged into the lime water. If the first effort to handle the matter is only partially successful because of too little potassium cyanide sticking to the work, we may repeat the procedure a number of times. That is, it may be repeated until the thickness of the skin of hard steel seems sufficient.

Naturally, in using this or any method, the surface of the work should be clean. There should be no scale, no oxidized places—nothing but plain and clean steel.

The process which employs a box and packing material and heats the whole in a suitable furnace is generally to be preferred to such methods as those which employ potassium cyanide.

Thin Skin With The Regular Procedure Which Uses Box and Packing Method

However, when only a thin skin of high carbon steel is wanted, the procedure may be varied a little from that which seeks to get a heavy shell in a long period.

It is usual to employ this method of getting a very thin skin of very high carbon on *tool steels*. That is, when the work that is to have a thin coating of very high carbon consists itself of tool steel, then we may use a modified form of the usual box and packing material process. The reader is especially requested not to mix up two different things in his mind. There is a process which uses a furnace, a box and a packing material (as pulverized bone). As ordinarily employed, it is applied to mild steel and the period of heating is long. This is one thing. I am not describing it just yet.

There is also another thing, which differs only in certain points from this procedure. This other thing is to be used principally on work that is already solid tool steel. It uses a furnace, a box and packing material; but the time of heating is shortened and the temperature is lessened. The object is to get a very high carbon skin on the tool steel. It is to be used for a gear, a spindle or other piece when the article is known to be tool steel through and through.

One great advantage of this method consists in the fact that *oil* may be used instead of water when the quenching is to be done.

The reader may want to know just what is meant by "tool steel" and also how he is to determine whether he has it in his hands or not. First as to what is to

be understood by the term "tool steel." It is to be understood that we are now speaking only of simple steels—composed of iron and carbon; and that we are not concerned with alloy steels.

A tool steel is one that contains enough carbon to cause it to be a suitable material for a cutting tool to be used on a lathe, a planer, a shaper, or the like. Such a steel will ordinarily contain 0.90 per cent of carbon or more. When this steel is heated, say, to a good or a bright cherry and then quenched, it will get quite hard. The hardness will go all through. A file may be used in testing it.

High Carbon Steels

However, there are a great many high carbon steels, one containing more carbon than another. It may be as a fairly good rule that the higher the carbon, the harder the steel after it has been heated and quenched. Also, the more brittle the steel. Now, some get so brittle, a razor steel, that they are unsuitable for use where shocks occur—as with many gears, etc. But the hardness after quenching would be a splendid thing, if we could get rid of the brittleness.

One way of doing this is to make the gear of a tool steel that does not contain an excessive amount of carbon. After this gear has been suitably hardened by heating and quenching, it will not be so brittle. But the wearing surface is only moderately hard. So, then, instead of simply hardening the whole in the usual manner, one may use the pack method and create a very thin skin of very high carbon. When the whole is now properly heated and quenched, the inside will be hard, strong, stiff and only moderately brittle. There will be a surface skin though that is excessively hard and this is splendid for wear.

Treatment of Tool Steel

Now, if the reader gets a gear in his hands which he suspects may be of tool steel all the way through and have a high carbon skin, he may proceed as follows. Before heating, get access to the inside. This may be done by laying the gear flat on its side and treating a small spot until the interior is exposed. This treating may be done with dilute nitric acid. The object is to get rid of the thin but very hard shell and thus get to the moderately hard interior.

If this interior is really hardened tool steel, the file will tell the experienced workman. He should know the difference, under the file of a low carbon steel and of a tool steel. Instead of the acid treatment, one may employ emery. In this case, the spot is to be kept wet, in order to prevent the steel underneath the skin from getting heated and losing its hardness.

Of course, in testing a gear or any other article suspected of being made of solid tool steel, one proceeds in such manner as not to spoil the article or even damage it.

If it turns out to be tool steel inside, then the repair may be performed and when the hardening is to be done

at the close, the box method, as modified, may be used and the quenching done in oil.

A Repair Stunt

This method of case-hardening tool steel is quite important from a repair point of view. First, it almost rivals the method which uses potassium cyanide in point of rapidity. It cannot be done as quickly, to be sure; but there is a reasonable shortness of time required. This naturally is a matter of importance. Then, the job will probably be a better one—perhaps a much better one. Further, there is no trouble because of poison.

A reason for the shortness of time required consists in the fact that a good deal of the carbon wanted in the external skin or shell is already there. Only a moderate amount has to be "injected."

This is readily seen, upon a little consideration. Suppose the tool steel in question has a carbon content of 1.00 per cent. And suppose that 1.50 per cent is what is wanted. This is quite different from the case where the steel that is to be case-hardened has a carbon percentage of only 0.30 or even less, though the outside shell is nevertheless required to have a percentage of 1.50. Naturally, with the tool steel, the job of "injecting" the required amount is a much smaller proposition.

This matter is of importance to the repair man, because it enables him often to replace a case-hardened part that has been broken by a tool steel part case-hardened by the rapid-pack method. But, one is not to go to an extreme. That is to say, the old part may have been made of soft steel for the purpose of having a part that might bend in service but would not actually break. Low carbon steels are more or less capable of being bent without being broken. As more carbon is added, the steel gets stronger, stiffer and harder. All this is good. But unfortunately, the tendency to brittleness increases as the carbon is added to. Consider this point closely.

(Continued next month)

* * *

MERCHANDISING

One of the best sales merchants in the world recently failed—and had his store closed simply because he tried to make all the sales in his store himself. The old saying, "Make your brains save your heels," if paraphrased into "Make your displays save your tongue," could well be pasted on every merchant's desk. Make your store do most of your work. Have your goods in such display that every time customers drop in, the rapid-fire guns of well-shown goods are turned loose on them. You are the general. Your helpers are your officers. Your goods are the privates that make up your army. Your window is the skirmish line—and many a battle is won right there.

Put your material spirit into your help. It is up to you to conceive the plan of attack, but developed loyalty in your men will soon have them arranging your guns in the windows, on the floor, on the shelves in a way that will get business.

Automobile Piston Fitting

Uncle Henry Gives Us Some Dope on the
Testing of The Engine's Most Vital Parts

By R. H. Kasper



HELLO, Uncle Henry, how's tricks?" asked nephew Bill. Bill had decided to pay Uncle Henry a pop visit and had found him in his garage, apparently in difficulties. Uncle Henry had the cylinder block removed from his engine and the connecting rods and pistons removed from the crank shaft. Holding a connecting rod in his hand, he was studying it intently.

"Rotten, kid," replied Uncle Henry in disgust, "Darn rotten!"

"Trouble?" asked Bill, who was a machinist from the city and delighted in solving intricate problems.

"Trouble is right, Bill," replied Uncle Henry. "And it serves me right. I put my foot in it this time sure. I had always prided myself upon being able to get away with things, but I'm blamed if I'm not stumped this time."

"Let's have the details, Unc; perhaps I can help."

"Hope so!" replied Uncle Henry. "It's just this way, Bill. You know that my engine needed new main connecting rod bearings. I always like to tackle some new kind of a job, and did a little book reading so I decided to do the trick myself. I bought a stock of babbitt and closely followed directions in pouring the bearings. At the same time, I put in new wrist pin bushings. which

"Well, I'll tell you. After I finished that job, I thought I'd lay off for a few minutes and enjoy a smoke. While I smoked, I carelessly picked up an old automobile magazine and turned over the pages. The first thing that struck my eye was an article telling how a guy had ruined his engine block by putting in new connecting rod bearings.

"It seems that the chap had failed to test the position of his pistons. The bearings, not being lined up properly, held the pistons on an angle. Though he managed to get the pistons into the cylinder without any trouble, the engine never ran right and soon developed a bunch of knocks. On taking down the engine, he found that the bearings had worn out.

A Family of Scored Cylinders

"The pistons had also been bearing so hard on one side of the cylinders, that proper lubrication was impossible and a nice family of scored cylinders was the result. Until I read that article, I was pretty well satisfied with my job. But since then, I've felt so darned unlucky that I'm afraid to assemble the engine without testing the pistons."

"Well, why not go ahead and test them," said Bill.

"I would if I could but I can't. The truth is I don't know how!"

"It's a cinch," said Bill. "You know that cylinders are bored at right angles to the bottom of the cylinder block. And you know that the bottom of the cylinder block rests on the top of the crank case. Therefore, if the pistons stand at right angles to the top of the crank case, they also stand at right angles with the bottom of the cylinder block and will fit in the cylinder bore without binding.

Trueing the Pistons

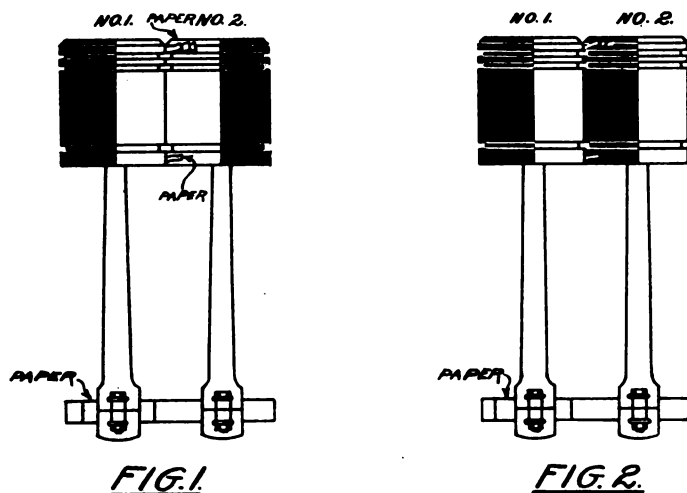
"All you have to do, then is to fasten the connecting rods and pistons to the crankshaft; place a try square on the top of the crank case and if the pistons line up with the square, all is well. Then—"

"Hold on, Bill," interrupted Uncle Henry, "You didn't ask me if I had a try square."

"Well, haven't you?"

"Yes, I have. But it's a cheap carpenter's square that has been knocked around a good bit. It might be better to assemble the engine without testing rather than depend on that square."

"Then, that means that we must tackle the job in a different manner. Have you a piece of shafting or smooth



I reamed with a reamer borrowed from neighbor Sparks. Now here's the job I've done," and Uncle Henry handed Bill a connecting rod to examine.

"Looks like a pretty good job, Uncle," said Bill.

"I thought so too," replied Uncle Henry. "That is—at first. But the more I think over it, the less sure I am."

"What do you mean?" asked Bill.

tubing about as thick as the crank pins and about a foot long? Also a feeler or thickness gauge?"

"I've got the shafting, but not the feeler."

"Very well then, get the shafting and a page from a magazine and I'll show you how to do an accurate testing job without tools."

Uncle Henry procured the shafting and the paper.

"Now to begin," said Bill, "we will start with two pistons and connecting rods. One we will call No. 1 and the other No. 2. First, wrap a piece of paper around the shaft and place connecting rod No. 1 on the paper, drawing up the bearing tightly so that the connecting rod tightens on the shaft. Then, place connecting rod No. 2 on the shaft, but without the paper. Draw up the bearing bolts so that the connecting rod will swing on the shaft without any play.

Setting the Pistons

"First, we must assume that piston No. 1 is perfectly square. Whether it is or not, we do not know, but we must assume so. Now we move piston No. 2 over against piston No. 1. Observe that it touches only at the skirt or bottom. This does not prove anything as pistons are made of a slightly smaller diameter at the top. The top, you know, is subjected to the heat of combustion and a larger allowance must be made for expansion.

"We now slip a piece of paper between the two pistons at the bottom, holding the pistons together so that they pinch the paper. We then take a strip of paper and slip it between the two pistons at the top. If the paper is not thick enough to pinch, we must double it or treble it. When the paper at the top and the bottom both pinch between the pistons, make a note to that effect.

"In this case, we mark down: 'Piston No. 2—Top, three papers; bottom, one paper.' (Fig. 1) Now we slip piston No. 2 off the shaft, reverse it and repeat the same process. (Fig. 2.) As we get the same results—three papers at the top and one at the bottom—it proves that piston No. 2 stands perfectly square with the shaft. Do you understand that, Uncle?"

"Not quite, Bill. One point fools me. In the first place, you assumed that piston No. 1 was perfectly square. Then, when you found that piston No. 2 compared favorably with it, you say that piston No. 2 is square. How do you get that way? According to my way of thinking, if piston No. 1 is out of square, then piston No. 2 is also out of square."

Measuring by Relationship

"I assumed that piston No. 1 was square for a very good reason—a psychological reason, in fact. Had you KNOWN that piston No. 1 was out of square, your mind would have been influenced thereby and you would believe for a certainty that piston No. 2 was also out a square. Therefore, I made the assumption in order to throw you off the track. But as I see that my psychological experiment went over your head, I will tell you. The truth of the matter is that the correctness of piston No. 1 has absolutely nothing to do with it. I can now positively state

that piston No. 2 stands absolutely square with the shaft."

"I don't quite get that dope, Bill. If No. 1 has absolutely nothing to do with it, then why bother with No. 1 at all?"

"For this reason, Uncle. We must have a stationary point to work from and No. 1 has been used for this purpose. Its position has been unaltered since the time we started. But we reversed No. 2 and found that each side of No. 2 piston bore the same relation to piston No. 1. In reversing No. 2, we reverse everything connected with it, including its relation to No. 1. Suppose, for example, No. 2 leaned slightly toward the right. Upon reversal, it would lean slightly toward the left. As each side of piston No. 2 would then bear a different relation to piston No. 1, it would require a different combination of papers on each side. When the same combination of papers is used on both sides, it shows that piston No. 2 is perfectly square."

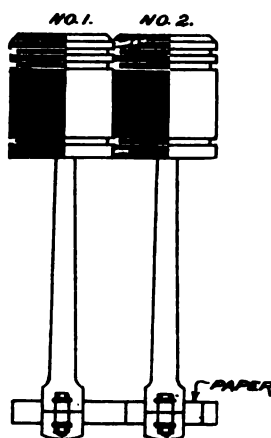


FIG. 3

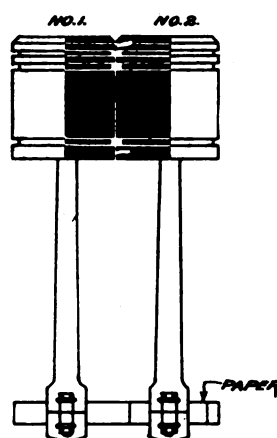


FIG. 4

"I've got you now, Bill. When you reverse No. 2, it is just as if you were revolving it on its center line. If the piston does not stand square, it will not stand parallel with its center line. It'll wobble, just the same as a kid's top when it starts to run down.

"That's the idea exactly, Unc.' Now we will fasten No. 2 tightly and loosen No. 1 (Fig. 3) Our test papers will show 3 at the top and 1 at the bottom. In fact, we already know this from testing piston No. 2. (Fig. 2) Reversing No. 1, our test shows that we get one paper at the top and one at the bottom (Fig. 4), proving that No. 1 is not exactly square.

"The amount which No. 1 leans to one side is equal to one half the difference between the thickness of the test papers used. For example, our first test (Fig. 3) showed three papers at the top and one at the bottom; while our second test (Fig. 4) showed one paper at the top, making a difference of two papers between opposite sides. The tilt of piston No. 1 is equal to one half of this amount or the thickness of one paper. By proceeding in this manner, we can easily determine just how all the pistons stand."

"Yes," said Uncle Henry. "But that does not tell us whether the connecting rod bearing or the wrist pin bushing is at fault, does it?"

"No, it does not," replied Bill. "Neither do we care.

"When a piston does not stand square, the general practice is to bend the connecting rod slightly in order to bring it square, regardless of which end is at fault. As the same remedy is applied in either case, it matters not which is at fault. However, while we are at it, there is another point which it may be wise to check up. You know that each crank pin on the crank shaft is located under the center of its respective cylinder.

"This means that the large end of the connecting rod should stand exactly central under the piston. The connecting rods have a certain amount of side play on their crank pins and wrist pins to allow for a certain amount of disalignment. But the disalignment may be greater than the allowance, in which case, the piston will be made to bear hard against one side of the cylinder. So, in order to play safe, we may as well check up this point also.

"This is done by the same method, the only difference being that the two pistons are held together while the measurement between the hubs of the two crank pin bearings is taken. A block of wood may be used to take the measurement, using paper to build up until the hubs pinch the paper. Reversing one connecting rod, as in the previous examples, will tell us if the connecting rod stands exactly central under the piston. If it becomes necessary to bend any of the connecting rods on this account, it is best to again test the pistons for squareness."

"By gosh!" said Uncle Henry. "I never knew you could do so much without tools. You sure do know a thing or two, Bill."

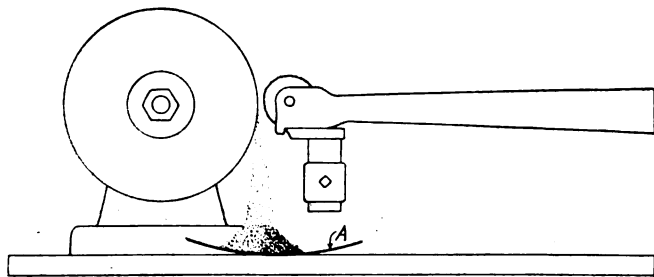
"You said it, Uncle Henry. But what I don't know would fill a good sized book!"



NUGGETS OF AUTOMOTIVE WISDOM

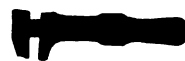
By Joe Bell

SUPPOSE you found that the valve grinding compound was all gone and it happened that the other places were out too—what could you do? Just this. Go to your emery grinder and first clean it off nicely. Then spread a piece of paper as shown at A or the



lid of a pasteboard box under the working side of the wheel. Next, with an emery wheel dresser, give the wheel a few applications, which will deposit a supply of clean, clear emery in your receptacle. Mix this emery with a little gear grease and you have valve grinding compound par excellence.

The term "emery" in this case is meant to include the various manufactured abrasive wheels sold under different trade names. Every place that has an emery wheel should have a dresser (and should know how to use it). It may be of the simple type that costs less than a dollar. Emery wheels need sharpening just as any other cutting tools do and when they get lopsided they have to be trued up—hence the need of a dresser. It is a good plan when this sharpening is done is to catch the loose emery and save at least a spoonful against the time when it may be needed for emergencies or odd grinding jobs.



FOR turning the beveled face of valves, many men prefer straight carbon tool steel to high speed steel. They claim the former will leave a smoother face on the valve because of the seemingly closer grain of the steel. The high speed steel is more brittle and it is claimed that this brittleness permits the cutting edge to check minutely when presented to the hard surface of the valve as it comes out of the engine. Practice seems to bear out this idea. Make the tool as hard as fire and water will produce, draw the temper to a light straw color, and by a combination of the two feeds of the lathe impart a 45° movement to the tool which is already of a broad flat face and set at this angle. This sliding cut ("shear cut" sometimes called) leaves a surface free from digs and ridges.



SOME people are speed cranks. Doc Leemon was one and if there was anything about his car that prevented it from making sixty, he raised Cain about the place 'till it was fixed. He bought a new Marson and everything was lovely until a Loco passed him out on the new concrete road to Goshen—came back and told the boss she made a noise like an Erie engine as soon as she was going over sixty miles an hour.

Well, we worked and fussed and finally eliminated every source of noise except the drive shaft. We put the drive shaft in a lathe and there saw that its greater portion was out one-sixteenth of an inch, i. e., one-thirty-second off center. This did not look like much but it was enough to investigate, on suspicion.

So, recalling a little of the theory of revolving bodies, we applied the formula for centrifugal force—that one where the force $= F = .00034 W R N^2$. W is the weight, which we took as 10 lbs., being two-thirds of the total weight of the shaft and as near as could be judged the amount of the forging that was off center. R is the radius of eccentricity in feet, which is $.0026$ ft. ($= 1/32''$). N is the number of revolutions per minute—in this case 3000, equal to the maximum speed of the engine.

Applying these values in the formula, we find that F equals 79.56 lbs., practically 80 lbs. Now, a centrifugal force of 80 lbs. would be negligible in ordinary machinery

but, tearing around 3000 times a minute under a car going 60 miles an hour, it is a force to be reckoned with. We reckoned with it by putting in a new shaft—one that had been straightened better before turning. And we found that the car ran as quietly as could be wished. But we could never get any adjustment from the Marson Co. for the poor one.



WE HEAR it said of such and such a person that they always "have good luck with a car" and we hear this repeated until we almost get to believing it ourselves. But nine times out of ten, this same "lucky" person is careful and thoughtful—"forethoughtful," to state it correctly.

And forethought consists in doing the *little* job on your own garage floor in preference to breaking down on the road and paying the bill for the *big* job that follows. Any man who looks over his tires once a week, then fills up cuts in shoes, puts a new insert in place of that leaky one, replaces the shoe that is ready to blow out, puts air in his spare tires as religiously as in the four others, and does other minor chores will not spend much time changing or repairing tires on a lonely road.

Oil, of course, is the great pacifier. Three-quarters of all wear could be eliminated, and would be, if car owners followed the advice found in the instruction book. It's a mussy job to change the oil in most crank cases but if it is done every 1000 or 2000 miles, the owner will be repaid by the sweetest-running engine for which one could ask, even if he didn't realize the money he was saving on repair bills.

Then there are springs and shackles and shafts and arms—to the man with his first car they seem to exist in profusion and (im) perfection but after a little, the blasé owner finds that he can care for them very simply by following out a systematic plan such as, for instance, under the hood one week, underneath the car the second week, and the remaining parts the third week.

Then, the habit of looking over the mechanism frequently will prove the "stitch in time." Take a wrench and try every nut and bolt on the car—it won't take half an hour and it may surprise you how many will move half a turn or how many were really loose. The jar of road service, wear, and the general readjustment that takes place in all machinery after a time permit bolts and nuts to get slack. A similar treatment with a screw driver will put smaller screws in a snug condition.

And the same treatment should be applied to spanner and other special wrench fastenings, to wheels, to the various parts of the body. Slamming of doors racks a body more than years of running on the road—most people slam doors, and complain, when one little drop of oil on the catch would make the door close with a velvety smoothness and save all that racking of hinges and catches, body posts, and the entire structure which has to put up with this "heroic" treatment.

A creaky rim is a sure sign of a loose rim. Perhaps

the bolts are loose. Then again the rim is bent; this means that the rim is seated but part way around—often on two opposite sides—and that the rest of the way it is free to weave and creak with the motion of the car and the unevenness of the road.

Rims that are bent out of circular form may be straightened—rims that are bent so that they cannot be made to lie in a true plane when on the wheel had better be scrapped. In this connection, it might be added that very few people ever oil the lug bolts or the bolts that hold on the spare tire but those few who do, find they can hold their tires much better and with less creaking and the sense of turning nicely oiled bolts instead of rusted ones is well worth the trouble.



Don'ts and Do's

The Cole Motor Company is sending out the following list of instructions. Read them!

1. Put yourself behind the other man's steering wheel.
2. Don't laugh at timid passengers. They're your guests. Make them comfortable.
3. Don't expect children to look out for themselves. The fact that it was the child's "fault" doesn't make death less terrible.
4. When a man in the wrong insists on the right-of-way, let him have it. You can't argue with a fool.
5. Get the hand-signal habit. It protects you as well as others.
6. When the man behind wants to pass, slow down and draw over. It's safer to have him speeding ahead of you than alongside you.
7. Don't dash by street cars as they are about to stop.
8. Don't try to pass the car ahead when another car is approaching, from the opposite direction.
9. Slow down and keep to the right as you come to the crest of a hill.
10. Don't dispute the crossing with a railroad train, you may have the right of way, but the train has the right of weight.
11. Think of the other road users when you have to splash through mud or water.
12. Remember that the pedestrian at the crossing has a right to cross.
13. Don't drive jerkily. It keeps the man behind you worried.
14. When your brakes aren't working the time to get them fixed is NOW.
15. If you forget the Rules of the Road you can safely fall back on the Golden Rule.

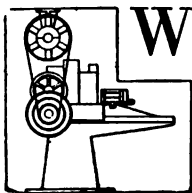


During a divorce trial a lawyer asked the fair plaintiff: "If you did not love him, why did you marry him?" She answered: "You see, when he proposed he looked so cheap I could not refuse the bargain."—*Business Language*

Spark Intensifiers

When to Install Emergency Spark Gaps, The Work They Do and Method

By Frank L. Almy



WE are often questioned as to the advisability of installing spark intensifiers or emergency spark gaps on automobile engines. Not long ago one of our subscribers wrote us to the effect that his engine seemed to be giving no trouble but that a friend had suggested the installation of a set of such intensifiers.

It is always a good plan to let well enough alone and if the engine gives satisfaction to leave it alone. An old friend of the writer once remarked; "If she goes, let her." Only five words but sufficient to make the meaning clear.

The trouble with many troublesome cars is that the owners are not content when the machines operate correctly. The average owner is seldom content with facts; if the car runs, he wants to know why and if it doesn't run he wants to know how to fix the thing so that it will run. He tinkers with the engine until that unit groans under constant and endless alterations.

Let Well Enough Alone

So long as the ignition system is in order it should require no help. All the engine needs is a good, hot spark in the firing chamber at the right time. The hotter the spark, within reason, the more "pep" there is to the engine.

Now the average spark coil is designed to give certain results. The cheaper coils are wound with the idea of furnishing a spark of a certain length. The engineers have figured that with a certain compression, a $\frac{1}{4}$ inch spark is sufficient and so the cheaper coils, for certain engines, will deliver a spark $\frac{1}{4}$ of an inch in length. The compression will cut this down to $\frac{1}{16}$ of an inch at the electrodes.

Such cheap coils may not be carefully insulated on the inside and if the spark gap is too wide, the spark will jump inside the coil, break down the insulation, and thereafter will not jump at the plugs. Once the coil is broken down it is practically worthless and no form of intensifier ever made will remedy the trouble.

Three Possible Conditions

Other coils may be properly made and contain an emergency spark gap which prevents overloading. Such a coil will give a certain length of spark, no more. This emergency spark gap, or protective gap as it is often called, is usually found in magnetos.

And so we have three possible conditions, a good coil which will give a spark $\frac{1}{4}$ of an inch long or more without puncturing itself; a poor coil which will be damaged if a $\frac{1}{4}$ inch spark is required; and a coil which is so designed that it will give a limited spark.

Now the spark intensifier is really an auxiliary spark

gap. If a system is equipped with such an intensifier, the coil must furnish a spark not only long enough to jump across the spark plug electrodes, but also long enough to jump across the intensifier gap as well.

Such an intensifier adds to the work which the coil must do and if the coil will not stand up under this additional strain, then the ignition system fails. If the sum of the two gaps is slightly greater than the emergency gap in the coil, or magneto, then no spark will jump in the plug, but all of the spark will be shorted in the coil.

Not a "Cure-All"

And so, the reader must realize that a spark intensifier is not a "cure all" for motor ills. An intensifier may do a world of good on one car and fail miserably on another; It may ruin one coil and work excellently on another.

But despite all of these things, a spark intensifier, on the average, is a good investment. The reader, by this time, is probably asking just what an intensifier will do and how it does it. We will try to answer this question.

Those of you who have played with spark coils have probably noticed that there is a radical difference between a long and a short spark from the same coil. We do not refer so much to the seemingly "fatness" or "thinness" of the spark so much as its color. The long spark is clear white and tends to give quite a snap when it jumps the gap while the shorter spark, or stream of sparks, is violet or red in color. Put a piece of paper between the gap points and the long spark will pass through it without burning the paper, while the short spark will char a hole and often set the paper afire.

Difference Between Condenser Spark and Spark Without Condenser

Those of the readers who have experimented with static currents know the difference between a condenser spark and the spark given off by the machine without the condensers connected. A condenser spark is white and noisy, it does not discharge in a stream but at intervals. The spark without the condenser is violet, has a hissing sound and discharges in a constant stream.

Now the long spark from the coil is similar to the spark given off by a static machine fitted with a condenser, while the short spark is similar to the non-condenser, static discharge.

The main difference is one of voltage. The long spark is of higher voltage than the shorter one because the current seems to have a storing action in the coil itself. When the voltage is high enough, the spark jumps across the long gap.

(Continued on page 56)

Motoring in Florida

Various Phases of the Automobile Game in that State and Others

By James F. Hobart.



I WAS talking lately, with a man who had just driven his Ford from Michigan to Florida. He showed me some figures made during and after the trip, which was made in 1920, when gas was a bit higher than at present. The figures give a "black eye" to many statements made by automobile drivers as to how cheaply they can tour the country, and they bring to mind the statement recently made to the writer by an experienced Garage Man, who said:—"It costs me ten cents a mile for each and every mile that I drive my car, taking into account everything, including interests on cost, depreciation, tires, oil and gas and every item of up-keep."

But here are the Ford figures:

Miles Driven 1861

Cost of oil and gas \$48.19

Gasoline, 122 gallons

Oil, 28 quarts

Car load 2800 pounds

Miles per gallon of gas, $15\frac{1}{4}$

Miles per quart of oil, $66\frac{1}{2}$

Cost per mile $2\frac{1}{2}$ cents.

The above has been found a very effective bit of data to "spring" upon those citizens of The U. S., Europe and Ethiopia, who are forever bragging about the mileage obtained with their autos per gallon of "gas."

Modern Gasoline and The Carburetor

The fuel used in cars now-a-days is so very different from that of several years ago, that entirely different methods of carburation are necessary in order to secure any satisfactory mileage at all. The writer once purchased a famous make of car and found it was giving between five and six miles per gallon of gasoline. Its carburetor was of the jet type, jacketed with hot water from the engine cooling system and also fitted with an electrical heating device for use when starting the car in cold weather. But, however well the accessories behaved, it was beyond the power of the jet carburetor to vaporize the heavier portions of today's gasoline much of which evidently went into the cylinders in the form of spray, uncombined with air, leaving the more volatile portions of the gasoline to do the work—what was done—or driving the car.

A modern carburetor was put on the car in place of the jet instrument and air was brought from around the hottest part of the exhaust pipe to mingle with the gasoline which was forced by suction, laterally, in a thin flat ring, crosswise of the jet of heated air which was drawn through the carburetor. The new carburetor at

once increased the mileage to $14\frac{1}{2}$ and 15, and enabled the car in "high" to idle along at less than four miles an hour, and "pick up" to a speed of sixty or seventy—if required.

With the old jet carburetor, priming of the cylinders was necessary whenever the weather was a bit cool. But there has been no weather here cold enough to prevent the car from starting *at once*, without priming, with the new carburetor. The arrangement of the "choke" mechanism permitted drawing of finely sprayed raw gasoline directly into the cylinders when starting, and from present behavior of the car, it seems that the carburetor would prove effective in below zero weather.

A temperature of 31 degrees is the lowest at which it has been possible to test the starting, in this locality, but the modern carburetor enables the car to start readily at that temperature, and to be *driven off at once*, without waiting for the motor to "warm up," as was always necessary when the jet carburetor was in use.

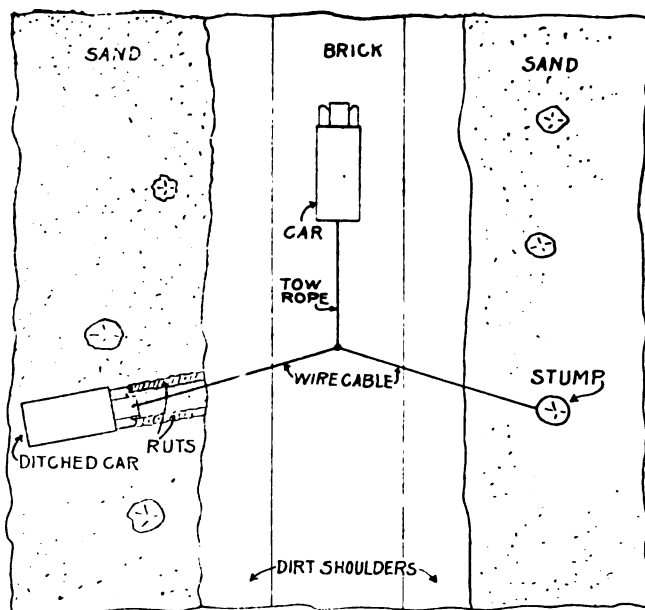


Fig. 1. A Powerful Pull Out

Although nearly all the important County roads in Florida are paved after a fashion with brick, either clay or bitulithic, there are still miles and miles of sand trails, just as nature left the soil, or rather the *sand*, for in many places, "soil" is an unknown quantity. Immediately after a rain, the sand will be found nicely packed and will bear up a car in good shape as long as the power wheels do not slip. But once the wheels begin to spin, woe be to the driver, for the wheel—usually but one of them though sometimes both, will burrow down and sink into the

soft sand like the wheel of a ditching machine. When that happens, as it frequently does, it's of no use trying to pull out, for twenty revolutions of the wheel will bury it to the hub.

Roads Being Widened

Many of the roads are paved or covered with crushed limestone to the width of nine feet, although to the credit of Florida, it may be stated that but very few nine-foot roads are being constructed now-a-days, such narrow pavements being found utterly inadequate to the heavy travel of today on Florida roads.

Many of the lateral, and all of the main roads are now having their paving increased to eighteen feet in width and the corners changed so as to give curves of good radius with modified approaches, that it will not be necessary in future to slow down to six miles an hour, run to a dead-end of pavement and then turn a right angle with only nine feet of brick to do so upon! When two to four cars make the turn in opposite directions at the same time—well, there are much pleasanter things about Florida motoring.

Sometimes, when negotiating a forest trail, the sand will rise up on either side of the rut, to axle or to hub-caps, and woe be to the car which gets "stuck" in such a situation. Go right down into "slow" and be careful that not a wheel slips. If it does, you for the jack and a pull-out, best way you can!

Modern narrow brick pavements are reinforced on each side by several feet of material which "packs" under the wheels of traffic. But many of the "stone-roads" of earlier days, do not have *hard shoulders* to turn out upon when passing other cars. When turning around on one of these narrow, old, stone roads, take great care that the power wheels do not get off the hard road. Instead of driving as far as possible toward the ditch, cutting the forward wheels around and backing as far as possible

across the road toward the *other* ditch—if there is any, stop the backing while the rear wheels are yet on the hard road and let the forward wheels do all the venturing upon the sand.

Two or three starts, forward and back, will be necessary to turn around in this manner, but better far to take a little time, than to run a wheel off the hard surface and have it begin to burrow downward like a ditch-digging machine! When such a thing happens, do not lose time trying to pull out under power, for that will only sink the wheel deeper. Get out the jack, lift that wheel out of its hole, fill in with sand and place some wooden pieces on top for the wheel to pull out upon.

Carry Some Blocking

The writer long since learned to carry several pieces of plank blocking in the car. Some bits of two-inch plank six inches wide and ten inches long. In fact, these pieces of blocking, together with some one-inch pieces, were cut to fit, together with the jack and towing cable, into one of the compartments under the front seat, and more than once, these pieces of blocking have saved the writer many a hunt for bits of wood whereby to pack some bit of soft sand which a power wheel had unwittingly burrowed into.

Pulling Out a Ditched Car

The writer invariably carries a good three-eighth-inch towing cable and while he has had to be pulled out only once, he has helped many other cars out of trouble, and the ditch, with that fine steel cable without which, his car never ventures out. A good method of hauling a car out of trouble when a straight pull will not do the business owing to the very narrow hard roadway is shown by Fig. 1, herewith. The cable is carried across the road, one end attached to the car, and the free end of the cable then made fast to a tree as nearly in line with the ditched car as possible.

Then a second car is hitched to the steel cable, either direct, or by means of a short piece of rope or a pole, and the second car is made to pull sidewise against the steel cable. Such a pull can have but one of three possible effects. Either the ditched car must move a short distance toward the road, the tree must pull over, or the cable will break!

If a good deal of care is not taken, it will be the cable which "lets go," for a jerk by the pulling car will exert far more tension on the cable than it can withstand. The angularity with which the steel cable is stretched, also has much to do with the holding or breaking thereof, for the flatter the cross-wise cable, the greater the strain upon it and the greater the force exerted to pull the ditched car back toward the road.

The Angularity of Pull

As shown by Fig. 1, the pull comes upon the steel cable at an angle of about 60 degrees and as will be shown by Fig. 2, at this angle, the pull upon ditched car is same as though the pulling car were hauling directly against it instead of through a crosswise cable.

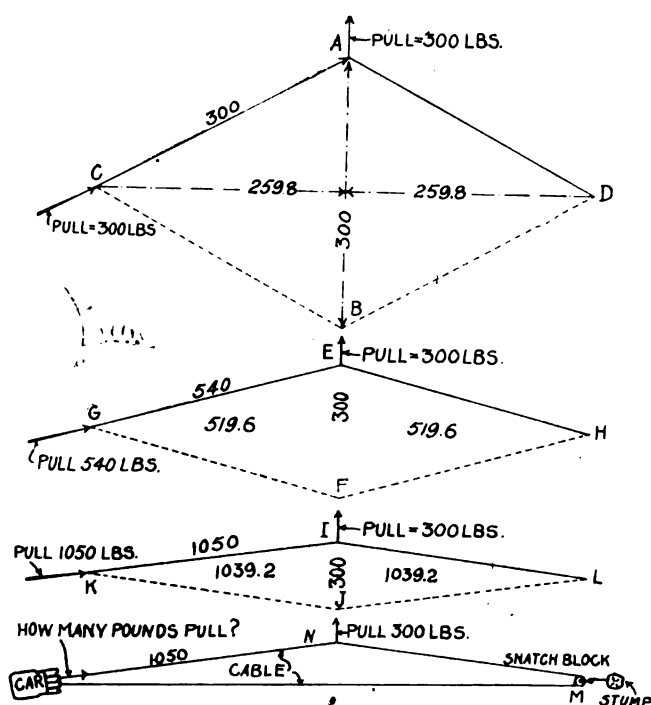


Fig. 2. Effects of Angular Pull

Effects of Angular Pull

In Fig. 2, the diagram A B C shows what will happen when making an angular pull with the second automobile pulling 300 pounds at an angle of 60 degrees with the cable as shown at A.

There is a way of determining the pull at any angle, without much calculating, and that method is by the "Parallelogram Of Forces" which you may find and study in almost any hand-book or work on physics. We will not bother with the "why" here. Simply lay down on paper the lines A C, and A D, representing the cable, then draw line A B from A, taking care not to incline line A B toward either of the other lines, but lay it down equidistant from both of them.

Laying out a Diagram of Forces

With any convenient scale, lay off line A B, the pull in pounds which is supposed to come upon the steel cable A C. D. If you call one inch on the rule equal to 100 pounds, line A B will be three inches long to point B. Then, through that point, draw line B C parallel to A D, and draw B D parallel to A C, letting the new lines cut the old ones where they may. In fact, the points C and D, are not fixed until the dotted lines have been drawn in.

So, just lay down the lines from A, of any length, then lay down parallel lines from B, and where the four lines cross each other, with be the point C and D. With the same scale which laid down the 300 from A to B measure from A to C, or from A to D, and those distances will be found to be 300 also, showing that at the particular angle at A (120 degrees) the pull at C, upon the ditched car, is the same as the pull of the live car upon the cable at A. Viz:—300 pounds.

To Increase the Pull

The pull upon the ditched car may be increased by making a flatter hitch at A. This is shown at E, where the distance E F is half that of A B. Working out the problem in the same manner, the pull E G is found to be 540 pounds, an increase of 240 over the pull A. C.

If still greater pull is necessary to start the ditched car, the angle in the steel cable may be made still flatter, as shown at I, where the distance E F has been halved again to give I J. It is still 300 pounds, however, laid down by a scale one-fourth of that first used at A B. But the pull I K will be found to be 1050 pounds, which will either start the ditched car or—break the steel cable—so, look out when pulling at a flat angle. By calculation, the above quantities may easily be found, also the distance horizontally from vertical line I J to K or L, which is 1039.02, by the scale used.

A Question For The Reader

But here is a query for you. Suppose a snatch block M be attached to the stump, and instead of making cable L fast, it is carried around snatch block M and thence

to the car in the ditch. Then, what pull would be exerted upon that car by 300 pounds pull at N. But *look out*, or you will break the steel cable, *pronto!*



Where Motor Cars Were Prohibited

MOTOR vehicles were strictly prohibited on the Island Prince Edward from 1908 to 1913 after which automobiles were permitted to be driven on the streets of Charlottetown and one other small town on three designated days per week. Practically all these restrictions were removed in 1919 except that motor vehicles are not allowed to operate outside of towns and cities during the month of April when the roads are very soft from spring thaws.

Progress has been remarkable since these restrictions have been removed, says Consul Crosby, in a report to the Department of Commerce, and today there are 1753 passenger cars registered in the Province, which has a population of 88,000 people. There are only 70 trucks registered in the province and most of those are of $\frac{3}{4}$ ton capacity or smaller, due to the poor country roads. It has been intimated that efforts will be made to limit the capacity of trucks in the Province, but no definite decision has as yet been reached.

It is estimated that there are 58 wheel type and 26 caterpillar type tractors in use, but on account of the small size of the farms in the Province the owners of the tractors are of the opinion that they are not an economical success. Three motor propelled fire-fighting engines are in use in Charlottetown, it being the only city in the Province which uses self-propelled apparatus.



TOUGH

Two negroes were lying behind a packing case on the dock at Brest taking the labor out of the alleged Labor Battalion. Said one boastfully:

"Boy, Ah comes f'um a tough breed. Mah ole man done cut his nails wif a ax an' brash his teef wif a file."

"Huh, ai't so tough. Mah ole man am a plumber, an' twice a week he done shave hisself wif a blow torch."

—*American Legion Weekly.*

The Reckless Driver

Officer—Yur onner, I arrested this man fer cuttin' corners in his machine.

Judge—What kind of a machine was he driving?

Officer—I don't know, yur onner, but from the way he was drivin' you'd think it was a lawnmower!—*Pelican.*

* * *

No matter how insignificant a man may be, he is firmly convinced that his superiority will some day be recognized.

Automobile Dealer and Repairer

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President and Treasurer

F. R. WHITTEN
Secretary

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MISSING NUMBERS—Our readers should remember that we are
always pleased to re-send numbers which have gone astray in the mails.

War Taxes and the Magazines

THE War Revenue Bill of 1917 carried a provision imposing increases on second-class mail matter as an emergency measure. This provision was written in the law without hearings or investigation, under pressure for war revenue. When the law was passed it was with the idea of raising money at once and a promise was made that the matter would be re-opened when the emergency ceased to exist. This promise was never kept.

Other emergency taxes have been removed and yet the publishers are still paying excessive postal bills. Now the postal system was never intended to be a paying proposition. The two cents which you pay to send a letter from Spokane, Washington to Tampa, Florida surely cannot re-imburse the Government for the cost of carrying that letter. The postal system is a public necessity and a benefit to the country in general and can only be carried on through indirect taxation revenue.

If your personal letter, which interests, perhaps, but two or three people, is carried by Uncle Sam at a loss, why should not the popular or technical magazines, which interest the majority of the people, be carried by the Government, if not at a loss, at least at cost price? Why should the publishers pay an amount in postal-costs, far out of proportion to other industries?

The subscription price to this magazine is \$1.50 a year and you receive twelve numbers, possibly more if

one or more happens to go astray in the mails. The average cost of mailing our magazine to you in normal times is between thirty and fifty cents a year while the actual value of the paper used in producing the magazine is approximately 84 cents.

In other words the publisher (ourselves in this particular instance), is selling an instructive magazine at practically cost price to the public and yet the public, which is represented by the government, demands that the publisher pay even more. And there are hundreds of other publishers who are in this same situation.

We only ask that the Government restore the postal rates of four years ago. The government will thereby increase its own revenue because, in such a case, practically all of the publishers will utilize the mails whereas as the matter stands at present, many of the larger publishers distribute their papers through other channels.

Rear Signal Lights

WITHIN the past few months there have been an enormous number of rear signal lights sold and doubtless the next few months will see more of such installations. For many years the law makers have fought among themselves; one faction has wished to write into our motor vehicle laws a bill to make compulsory the installation of a rear light signal, the other faction against such a measure.

It is generally conceded that a rear signal is a great convenience. The waving hand of the driver, usually accompanied by the frantic signals of every other occupant of the car, often puts the driven of the car in the rear, in an embarrassing position. Too often the driver is so weak and tired that, instead of putting his hand out at right angles to the car, he drops it over the door and then waxes very indignant if the fellow behind gives his car a not too gentle bump of protest.

Most of us have driven for miles behind the man who keeps shaking the ashes from his cigar, or the man who insists upon pointing out scenic spots.

And perhaps this is why the rear signal has so suddenly blossomed upon all kinds of cars. The rear signal is automatic and attached to either the clutch or the brake. There can be no doubt as to its meaning and it doubtless will be the means of preventing many accidents that might otherwise have happened.

But the rear signal, like every other accessory is being badly abused and unless some of the foolish drivers can be made to see reason, it will soon be considered a worthless device.

We cannot seem to eliminate the fool driver, the fellow who thinks that automobiles and roads are made purely for his enjoyment, the fellow who turns a corner on two wheels and stops in the narrowest parts of the road to light his cigarette. This same ignorant abuser of common rights is the one who cuts off the switch from his rear signal and leaves the red light shining its "STOP" warning at all times.

Nothing can be more grotesque than to see a Flivver car, bumping along at its extreme and noisy limit of 30 miles or so an hour with a "Stop" warning shining red to the rear. The driver would appear far less ridiculous were he to carry a stop sign painted on a mudguard for then he would not be wasting valuable current.

The red, "Stop" warning on many cars shines for hours at a time like a meaningless smile. The car owner is at

fault for such a condition and he has but wasted his money in buying such a device for it does no earthly good.

So, brother reader, if you have such a device on your car, see that it means something, see that the switch works properly and that the device is not like the little boy who had the habit of crying "Wolf" when his complaint was not necessary.



GARAGEMEN I HAVE MET



SOME brilliant scientist has remarked that once things have leaked out, one cannot hide a rotten egg behind a newspaper. There is something very assertative about an aged egg, it needs no publicity agent, it's charms are never hidden, once its exterior crust has been punctured. And it is just about the same thing with a poor mechanic. Put a "faker" into your garage and inside of a month all of your customers will know about him just as surely as they would be aware of a rotten egg in a home restaurant.

In compiling this article of "Garagemen I Have Met," I want it distinctly understood in advance that it is written in the spirit of kindness. We cannot overlook the facts. The trade in general suffers from the mistakes of a few. Let a car owner be given poor work in three successive repair shops and he is ready to characterize the trade in general as a "bunch of crooks and robbers."

Eliminate the Bad Eggs!

The repair game will never prosper until the "bad eggs" have been eliminated. If any of the mud happens to hit you, then you will find it easier to clean up the mud hole than to give the mud slinger the trimming, for if there is no mud to sling, no one can sling it.

I am also compiling this article with the idea of warning my car owner readers what they may expect in some cases. It is a "tip" to some readers, a warning to others and I have no "axe to grind" with either class.

We have in our town a repairman by the name of—well, let us call him "Packard Bill," I only hope he recognizes this nom-de-plume. Bill has a wonderful business, his shop is always filled with work and if it isn't, he always has a faculty of making two jobs grow where only one grew before.

Not long ago I went with a friend, who owns an Oldsmobile car, to have a new spring put upon the Bendix drive the old one having been broken. We were interested in finding what "Packard Bill" would have to say about the job.

We drove the car into the garage and tried to act

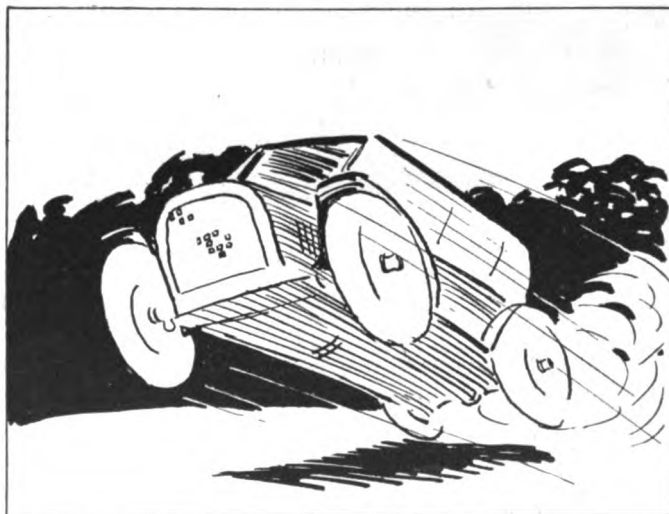
innocent. "Bill" came over and we told him that *something* was wrong, the starting motor didn't seem to crank the engine, we were in deep trouble. "Bill" lifted the hood, looked troubled, sat in the seat and tried the starting switch, whistled once or twice to show his tremendous surprise, hummed a tune and frowned a deep, important frown. Then he gave us his verdict.

"The starting motor doesn't function properly, needs a complete overhaul and perhaps the starting switch is shorted. Mebbe one or two of the gears are stripped. Probably take about two days to locate and fix the trouble. Will do a good job for about \$25. If new parts are necessary you'll have to pay for them."

Now any green repairman would have seen exactly what was wrong the instant he lifted the hood and I haven't the least doubt but what "Bill" knew his business, but we looked like suckers and tried to act the part, hence he figured on some easy money.

We pleaded urgent necessity and grasping our watches and pocketbooks firmly, keeping our mouths closed to protect our gold fillings, we chugged forth to another garage.

The garage we stopped in was a "one man shop."



"How can a car be joy driven without showing additional mileage on the speedometer?"

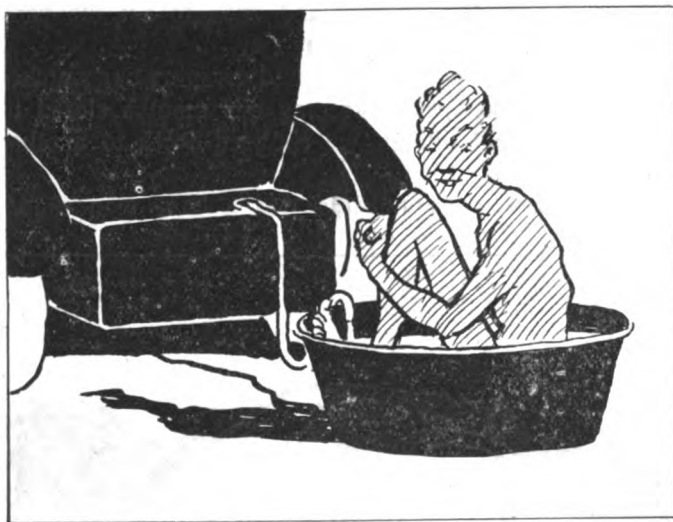
There wasn't a long line of cars with women drivers in them, as there was before "Packard Bill's" garage, but despite this the man who ran the place seemed to be fairly busy. He listened to our story, lifted the hood and stated simply that the spring was broken and that it would take him from half to one hour to repair it, depending upon how hard it was to get the two retaining bolts out. He told us that it was all right to run the car for a few days until he could get a new spring and that if we would stop or leave the car two days following he would have the thing done in a "jiffy."

We produced a new spring, which we had been carrying in the tool box and he did the work in less than a half hour. His charge was 75 cents and he said he wouldn't have charged anything for the work if there had been any other repairs to be made, or if we had been regular customers.

"Planting" the Evidence

After I had carefully bent the points in one of my spark plugs so that the thing wouldn't fire I drove up to a garage where work seemed to be very scarce. The "boss" was sitting in front of the door, so I figured that his time was not very valuable. As an excuse I asked for five gallons of gasoline. He gave me the fuel and then took the bait I had offered and suggested that one of my cylinders was missing. Naturally I implied that I was surprised, but that the engine might need attention. I told him I would like to have it fixed if it didn't cost too much and asked him if he would tell me the trouble and make a price on the work.

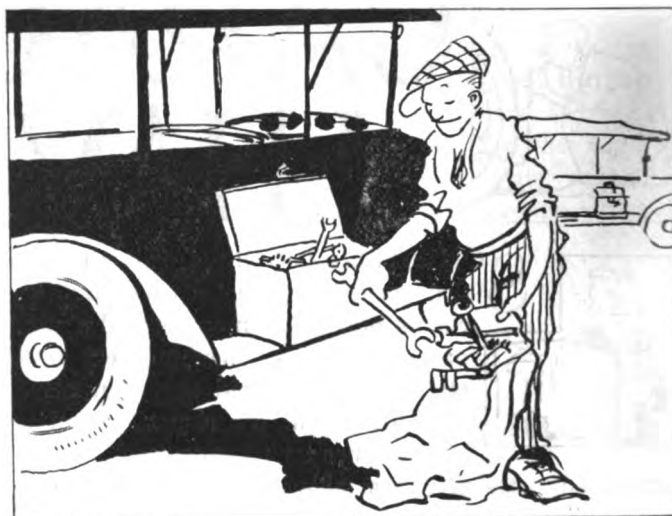
He pattered around making various tests, and he seemed to know what he was doing but after playing around the shorted plug for a few seconds, (long enough to be sure



"I have no objections to giving the boys gasoline to bathe in—or drink if they want it."

that was the trouble), he informed me that I needed a new distributor head and possibly a new coil. But he thought he could fix me up for about \$5. He was both excited and profane when I handed him my card and showed him the shorted plug, but, as I pointed out to him, had he been honest with me I would have bought a new plug from him and said nothing.

During the past year I have found why most garage men use valuable gasoline for cleaning, I have heard that some repair men take their weekly bath in gasoline but don't quite believe this. At any rate I know several garages where gasoline is free. Of course some one must pay, but the theory is that a sucker doesn't know he is caught if he is unconscious when he is pulled out of the water. In words of one cylinder, if the repairman uses your gasoline to wash his hands in, his bawth is free. Several times I have found that a tank full of gaso-



"One of the worst evils existing in a public garage is the borrowing habit."

line left in a garage evaporates rapidly, even as rapidly as a gallon an hour.

This rapid evaporation problem is a serious one and I have even gone so far as to paste a piece of paper over the tank drain plug and across the oil pan drain, (for in some garages even oil evaporates) and yet the fuel somehow or other manages to escape me.

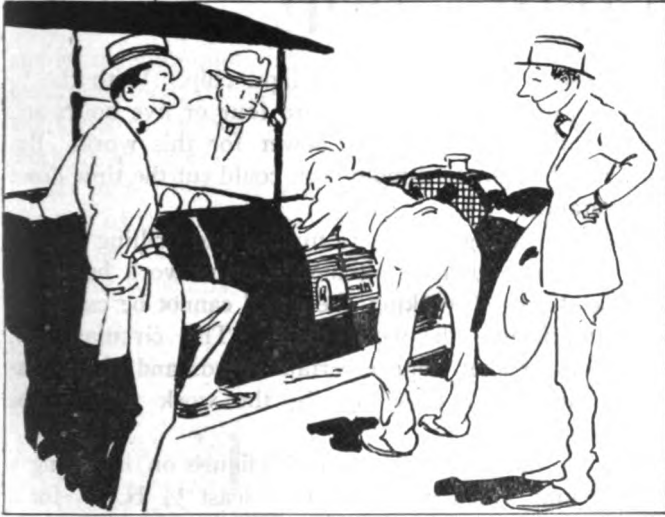
Now I have no objections to giving the boys a few gallons of gasoline occasionally to bathe in, or to drink if they want it, but I really think that they should not charge me storage fees and make me pay them to take it.

A Commodious Garage

Which brings me to another glorious feature of the garage-storage business. In my town practically every second man drives to the station in his machine. In a large number of cases the man takes his car to one of the garages near the station and pays a small sum to have it put under cover for the day. This obviates chances of theft and damage.

Most of the commuter's trains arrive in town between 5 and 6 o'clock in the afternoon and the garageman usually asks his customer which trains he expects to arrive upon. Armed with carefully compiled statistics of arrivals this garageman can accommodate from 30 to 40 more cars in his garage than there is floor space. I'll divulge his secret to my panting readers, maybe you are one of his customers, maybe you are a garageman who can take advantage of his scheme—but please don't try it on my car. Let's assume you drive your car to his garage in the morning.

You park your car in front of his door and ask him if you may drive in. You tell him that you expect to arrive on the 6 o'clock train. The garageman enters in



"Packard Bill lifted the hood and looked troubled"

his little book—"Tall gink with red hair, back at 6, car number 64392," and tells you to leave your car where it is and that he'll drive it into the garage in a few minutes so that he can put it handy for you at night.

Just at this moment a second car puffs up and you watch the garageman as he writes, "Short, dumpy gent with whiskers, back at 5.28, car number 89256."

Other men short and tall, lean and fat, bewhiskered and bald arrive, leave their cars at the curb and run for the train. Cars are driven into and out of the garage but your bus remains in its original tracks all during the day. Along about five o'clock the garageman bustles out and drives in a number of cars, among which is that of the "short, dumpy gent with whiskers." And when that short, dumpy gent arrives promptly at 5.30 or thereabouts, if the train is on time, he finds his car in the garage.

Storage (?)

Just as soon as the 5.28ers have taken their cars and driven away, your car is jazzed into life and into the garage it goes, ready for you when you arrive half an hour later. You pay your fee for storage (?) and drive away satisfied that your car has had full protection for the day.

Should you arrive on an early train, an hour or so sooner than you had planned, you will find your car on the street. But the garageman will inform you that he has just driven it out so that it will be handy for you; or at least that's what he told me.

The old, crude method of acquiring excellent tools by the "borrowing" or "trading" scheme has passed away in most of the garages. I assume that the modern garage is fairly well equipped with tools and that they do not need to depend upon their customers—or perhaps the modern garageman is too honest. But there was a time when you could drive in with a full kit of tools and return two hours later to find not even a note of thanks.

I remember the time when there was a wave of "trad-

ing" going over the garages. The garageman would have several of those excellent ten cent wrenches that one usually finds in a Ford car kit. He would find a better wrench in one of the cars and make an even trade because, of course, this would not be stealing. On one trip from New York to Boston I was the innocent party to three trades of this kind; I started with the cheapest wrench I could buy and ended up with a battered but serviceable steel wrench which had been sprung from good lineage.

Always Help the Garageman

When you leave your car in a garage for the day, or night, brother reader, always tell the garageman the exact hour you will call for it. This procedure removes a great weight from his mind and he appreciates your thoughtfulness. If you can leave your car for three or four days, for instance, just to have the carburetor adjusted, or the grease replenished, you will be doing a service to your fellow motorists.

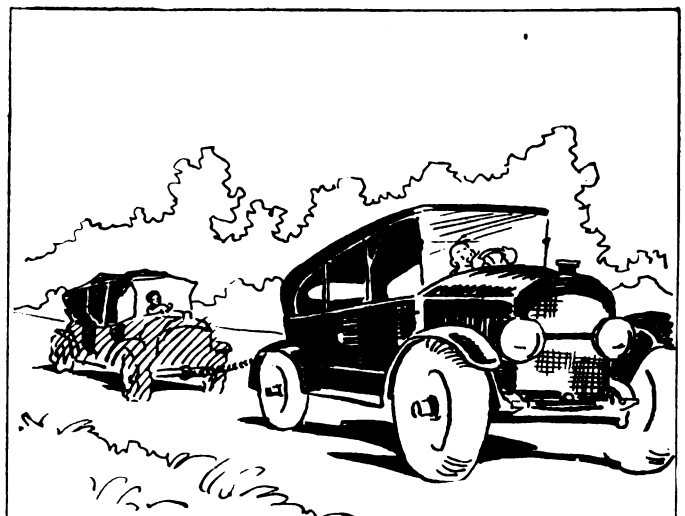
By doing this, the garageman can charge you storage and at the same time he can give the car an excellent road test. To adjust a carburetor under these conditions it is often necessary to drive the car several hundred miles.

I was in a garage after some fuel a few years ago and a call came in upon the phone for help, or at least I assumed that help was wanted, for the foreman called to one of the mechanics and gave him road directions. The mechanic put on his hat and coat and came back to the foreman with the question as to what car he should take. "Take the Cadillac," said the foreman.

The Cadillac that the greasy mechanic drove away in was a new car and was entirely out of keeping with what I knew of that garage so I took registration number out of curiosity. I later found that the owner of this car was a member of my club and I casually inquired about his machine. He told me that he had but recently put the car into the garage in question for an adjustment to the ignition system and that the proprietor had claimed a week's time would be required for the work.

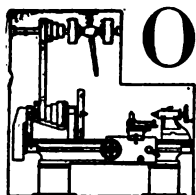
Evidently the proprietor needed a car in his business

(Continued on page 60)



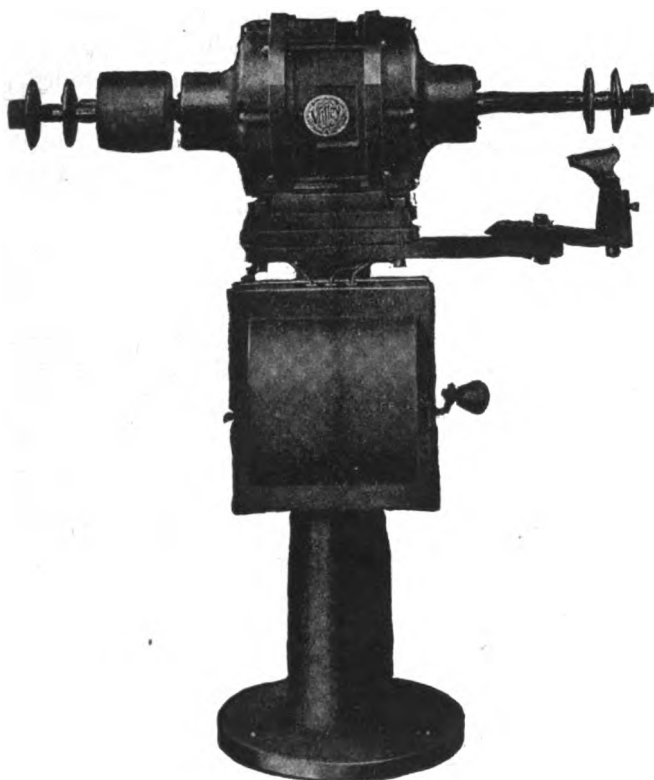
"The garageman can give your car an excellent road test"

Our Own Repair Shop



OBVIOUSLY one cannot expect to operate a machine shop without some source of power, hand or foot driven machine tools are as impractical as cast iron chisels. We have already described our machine tools, the lathe, the saw and the drill press. In the average repair shop where only small work is to be done the power equipment need not be especially large.

We have suggested that the small shop might send out the larger jobs such as trueing flywheels and facing off cylinder blocks not only because time may be saved but because heavy tool equipment costs more money than it is usually worth to the average repair shop. Under each conditions a three horse-power electric motor will answer the purpose.



The Valley Electric Motor-Grinder Made by Valley Electric Co. of St. Louis, Mo.

Since we are to describe our power unit in this issue it might be well to consider the whole question of power at this time and have the thing settled once and for all.

In working metal the question of power is not especially important, unless the time element is considered. A $\frac{1}{2}$ horse power motor will do enough work, given plenty of time, for the ordinary repair shop. If, for instance, you wish to true up a 16-inch fly-wheel you can gear the lathe

to its lowest speed and take a light chip. With the $\frac{1}{2}$ H. P. motor the job may require four or five hours and the motor will furnish only power for this work. But with a higher powered motor you could cut the time down considerably.

The same thing applies to milling and drilling and, in fact, most any kind of automobile metal work but when it comes to wood working, the speed cannot be cut down without affecting the work done. The circular saw, jointer and planer require certain speeds and if the machines run below these speeds, the work will not be smooth.

For the small shop one should figure on installing a driving unit which will furnish at least $\frac{1}{2}$ H. P. for a 10-inch lathe; $\frac{1}{2}$ for the drill; 1 H. P. for a milling machine and 2 H. P. for wood saw, 10 inch blade.

If two or more machines are to be used at the same time, naturally a larger motor will be required. But the small shop can be so planned that but one machine tool need be used at one time.

Electricity is usually the cleanest and easiest power to use. Each machine may be unit driven and the line shafting and belting eliminated. No excess power need be used and the motor absorbs only as much current as necessary to develop the amount of power used.

In our machine shop we were, unfortunately, limited to the size of motor we could use. The shop is located away from the main power lines and we were limited to 25 amperes of current. The line voltage is 110, alternating and since an alternating current motor absorbs a large amount of current for starting, we could not install a machine larger than $\frac{1}{2}$ H. P.

We were fortunate in obtaining a motor made by the Valley Electric Company of 3159 South Kingshighway, St. Louis, Mo. The motor is designed for grinding and carries a $\frac{3}{4}$ inch spindle with space for two grinding wheels.

The valley motor, we understand, may be purchased in any size from $\frac{1}{2}$ to 5 horse power and after trying out their small machine we can say that we cannot find anything to criticize in it.

The bearings are double-row, self cleaning, SKF make and are provided with large housings in which a sufficient amount of oil may be carried to last for many hours of running.

Being absolutely dust tight there is no chance for dirt, dust or grit from the grinding wheels to work into the machine. The machine which we have is designed for heavy duty work and all of the parts are large and massive.

As many of our readers are aware an alternating motor generates more heat per horse power than the same sized direct current machine. For this reason it is customary to ventilate the armature, but if the armature is ventilated,

there is chance for the grinding compound to work into the windings and bearings and damage the machine. With the Valley motor, however, such troubles are virtually impossible.

We have operated the Valley motor in our experimental department for more than four hours continuously and most of the time the machine was operating under its maximum load, though at no time did the machine show any signs of heating, being only pleasantly warm to the touch at all times.

Our motor is fitted with a six-inch grinding wheel on one end of the spindle and with a three-inch driving pulley on the other. The driving pulley is belted to our circular saw, which has been previously described. Arrange-

ments have been made so that the motor will drive our 12-inch Champion lathe.

This would seem to be an ideal installation for the repair man who cannot afford but one power unit. The one thing to remember, however, is that an alternating motor of this type must be started under a light load and the maximum load put on by means of sliding belts or clutch pulleys.

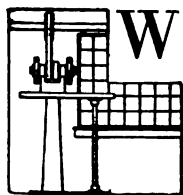
The machine runs at 1800 R. P. M. on single phase, 110 Volt, 60 cycle current and when belted through the counter-shaft to the lathe will operate that unit at between 300 and 400 R. P. M. which is the proper speed for this machine.



Irregular Engine Operation

Why the Adjustment of One Particular Unit May Not Synchronize the Engine

By F. L. Phillips



WHY do two cylinders of my car operate satisfactorily while the other two cause trouble and then when I've fixed it so that the first two are all right the other two go bad again?"

About every three days I get a question in the trouble department which is much the same as this. It isn't always about two cylinders, for at times it is three, some times only one, but the poor car owner is fixed between the Devil and the deep blue sea, all of the cylinders can not be made to agree. By working the needle valve, in the carburetor, one trouble may be obviated only to cause others and so the owner often thinks all of the trouble is in the carburetor when it may not be.

Study of Internal Combustion Engines

The average owner does not seem to realize that carburetor and ignition troubles are closely related. No man living can listen to a skipping engine and always be sure of the trouble; true the repairman often shows his wisdom by *guessing* and tries to make one think that he is right, but not all repairmen are good "guessers" wise as they may appear.

On the other hand we have the scientists who have made internal combustion engines their life study. These men wisely talk of synchronism and power curves, of flame propagation and stroke-bore ratios. The first class of wise repairmen make their money with their brains, by what they don't know as well as what they know, and so they *won't tell* the poor, average motorist all they know; while the second class of wise scientists tell us in words so long that we cannot *understand* what they say. So what is the poor motorist to do? Or what is the average repair man to do?

We have one fact which we wish to tell our readers which, to our knowledge, has never been brought out fully and which may explain the reason for many of our readers' troubles; the matter of spark plug adjustment.

Some time ago an experimenting scientist discovered the word "synchronism" and applied it to the gasoline engine. Goodness knows the poor old engine had troubles enough without adding to them but the scientist had no mercy and "synchronism" landed on his back. What the scientist wished to infer was that power impulses must be synchronized if the engine is to work efficiently.

"Synchronism"

In other words the explosions must occur at the same relative point in the piston travel, in each cylinder, or the engine will not develop its full power. The engine may pound or act sluggish, when it is not "synchronized."

Now that wise old scientist was right, as scientists usually are, but other people, not so wise as he have since seized upon his pet word and used it in their own way. And so we hear of synchronus timers, synchronized coils and "manifolds making for synchronism." But we seldom hear of a perfectly synchronized engine, for perfection is difficult to attain.

The engine can be synchronized fully, if we may use the word in a broad sense, when each reciprocating part receives a power impulse, of the same strength, at the same relative period of its cycle. In other words if piston number one is pushed downward with an impulse of 500 pounds per square inch and the impulse begins at the top of its stroke, then the engine is synchronized only when pistons numbers two, three and four receive a 500 pound impulse at the tops of their strokes. Otherwise the engine will "gallop."

Because so much has been said about "synchronism" the layman puts too much stress upon certain details and hence we write this article. One of the details which he considers is that of spark plug electrode adjustment.

Talk with the average "highbrow" mechanic and he will impress upon you the fact that spark plugs must be adjusted all the same or the engine will not be synchronized. He stresses the plug adjustment but makes no allowances for the other items which must be considered such as compression, gas mixtures, carbon deposits, etc.

It may be that the engine can be made to run smoothly only by having each plug adjusted differently from the others. Let us consider, for a moment the following example.

An Example

The Ford engine which we will consider has been run for two years and though in fair condition has the faults of a normal engine used for that time. Cylinder number one leaks oil, the compression is two pounds per inch less than the other three, so naturally it does not draw in quite so much gas as the other three or compress it so well. Consequently this cylinder requires a hotter spark than the other three. With this condition this cylinder should be fired slightly sooner, proportionately, than the other three.

Cylinder number two is in line near the carburetor and receives a good charge of gas, compression is good and this cylinder may be considered as being as efficient as any cylinder could be. A normal spark will fire it.

Cylinder number three is the same as number two in that it receives a good charge of gas but the exhaust cam for this cylinder is worn so that the old gas does not all escape. It follows that the charge in this cylinder is slightly different from that in number two and number one.

Cylinder number four has good compression but is farther away from the carburetor. The intake manifold to this cylinder is warmer than that to number one for the breeze from the fan wipes the heated air backward and the last cylinder manifold gets the benefit of it. Thus the charge in this cylinder is fully vaporized but is more expanded than that in any of the other cylinders.

If you will stop for a moment and consider the conditions in the four cylinders you will see that with the same sized spark and the same timing they will not fire alike. An adjustment which will fire number two or number four cylinders will not serve in number one or three, and the reverse fact is true as well.

Of course the ideal method of repair would be to put all the cylinders into the same condition, same compression and same every way; then the plugs could all be adjusted the same. But the result would not warrant the expense. The easiest thing to do is to treat each cylinder by itself and to adjust each plug for the best results in each particular cylinder.

The adjusting of the plugs correctly is a job which will require patience but the result will amply repay the pains. The engine should first be started and warmed so as to form a basis upon which to work. A trial of each cylinder

should be made in order to get an idea as to how each cylinder performs. This is done by shorting three of the plugs and allowing the engine to run on the single cylinder. The carburetor is adjusted and valve clearances fixed so that the engine will perform on at least one cylinder independently.

Let us take an example for illustration. Our first experiment shows that the engine will not run on either of the four cylinders but requires two to keep it going. We will give the engine slightly more gas and note the result, possibly we find that it doesn't run so well with this adjustment as before, so we cut off the gasoline supply slightly. We finally come to a point where the engine will run on cylinder number two as well as could be expected; cylinder number one is a failure but cylinders three and four fire weakly. The engine will not run on either cylinders one, three or four, but four fires the better of the three.

We next take the plug from number four cylinder and adjust the points *farther apart if there are signs of oil leakage or fuel moisture* in this cylinder. But if the cylinder is dry, then we adjust the points slightly nearer together. Upon the next trial we can see if the cylinder fires better or worse than before. By giving this one cylinder all of our attention we can get the best adjustment for this particular plug. Once having adjusted cylinder number four we can follow the same course in cylinders one and three.

A second detail which is often clouded is that of valve clearance. Before playing with the valve clearance it is necessary that all of the spark plugs be adjusted as we have outlined.

Ford Engine Not Provided with Valve Adjustment

Unfortunately the Ford engine is not provided with a valve adjustment and for this reason it is not an easy matter to get a good adjustment with the standard equipment. However, it is possible and highly advisable for every owner to fit his engine with a valve adjustment. A number of makers put out little steel cups which fit over the valve stems or the tappets and the little cups are provided with thin steel washers for making the proper adjustments.

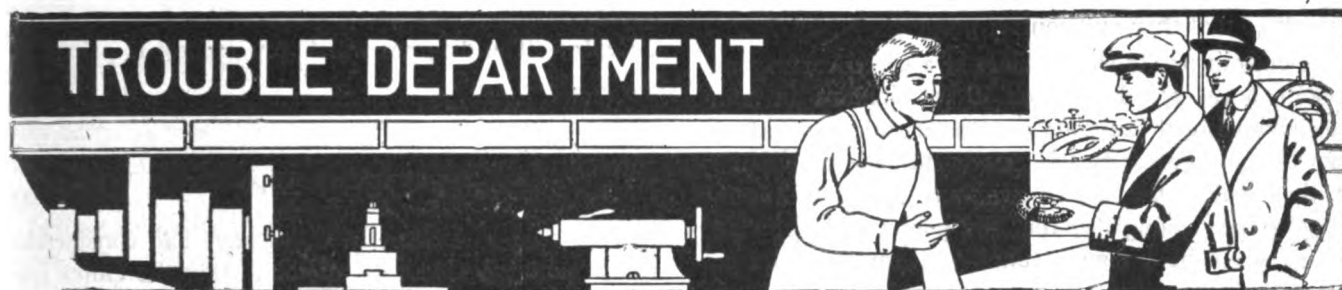
Roughly speaking a clearance of $1/64$ of an inch is proper on the Ford engine, after the engine has operated long enough to be fully warmed up. In making the valve adjustments all the valves should first be set to this figure. The engine should then be started and two, or three if possible, of the cylinders shorted out.

The next step is to place a "feeler gauge" between the tappet and valve stem of number one exhaust valve and the engine action noted. Feeler gauges carry several thicknesses of steel and various thicknesses may be tried. If the engine improves with the gauge in place, then the cap should be built up this amount.

In the same way each of the valves should be tried in turn. If the addition of the gauge between the stem and the tappet makes no difference in the action of the engine, or slows it down, then of course the original adjustment is to be left.

In closing we might advise our readers to forget the word "synchronism" for when Mr. Ford built his fliver

he simplified it to such an extent that he could omit this part of the mechanism.



Maxwell 1914 wiring diagram

3109

From M. W. Wellington, Iowa.—Will you please publish a diagram of the wiring used on the Maxwell A35 1914 car?

Reply:—The diagram you request is published on this page.

Cut-Out Trouble

3110

From E. A. Rinige, New Jersey.—I am experiencing some trouble with the Gray & Davis system on my Paige, 4 cylinder car. The trouble began with the failure of the generator to charge the battery, but in time I located the trouble and fixed it apparently, at least so that the generator normally produces the charging current.

But when the light are on, the amature of the cut-out jumps constantly. This trouble does not exist unless the lights are on or when the engine is stopped and the lights are burning. The ammeter also jumps to the discharge side at regular intervals but the lights do not seem to be affected.

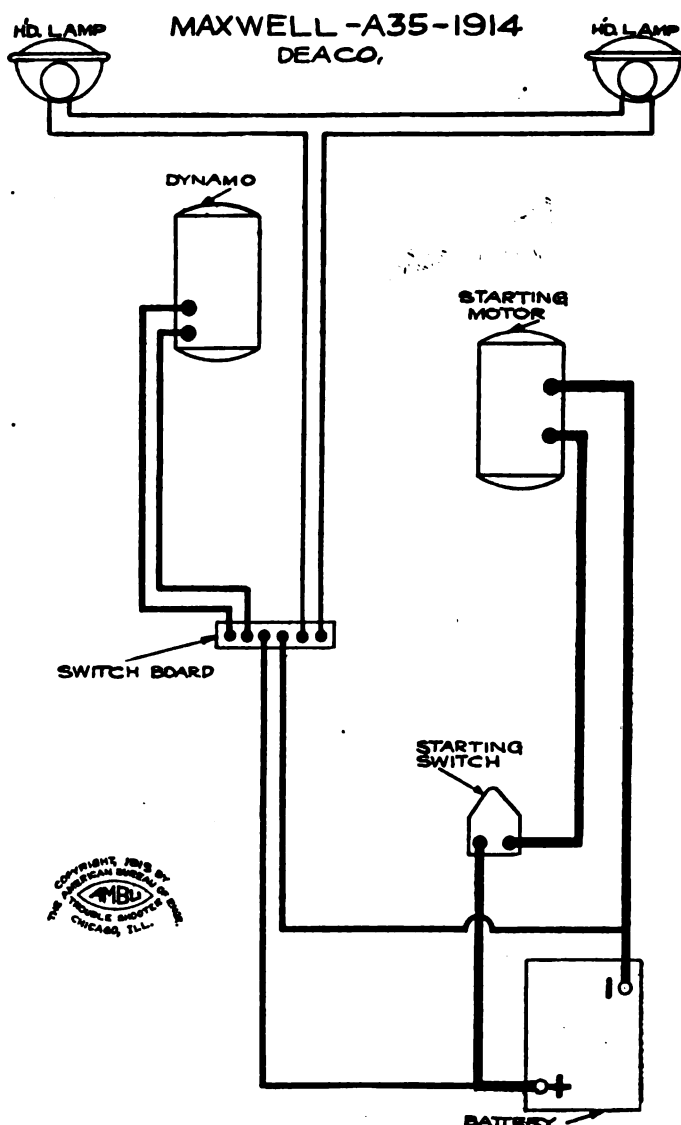
Reply:—The trouble may be due to either of a number of things which we will endeavor to take up in the probable order of their occurrence.

On first thought it would seem that there might be a short circuit in one of the lighting lines between the switch and the light. Such a "short" might be caused by a rubbing or swinging wire which makes a contact with the frame, perhaps, for only a few seconds at a time. In such a case the vibration of the car would make and break the circuit.

Such a short circuit might be heavy enough to short out the field windings of the generator and that unit would stop working for a second or so and the cut-out points would normally open the minute the charging current fell below its proper rate. However, the breaking of the circuit, (the opening of the cut-out points) would remove the generator short-circuit and the cut-out would close again. Naturally the ammeter hand would swing back and forth under such conditions. The battery would furnish enough current to keep the lights going regardless of the short-circuit.

To locate such trouble disconnect the tail light wire at the switch and try the system out; if trouble still exists put back the tail light wire and open the headlight circuit. As soon as you find which circuit is at fault trace out the wiring in that circuit. Disconnect the wires at the lights, etc., until you find why that particular line is causing trouble.

But it may not be that shorted wires are causing the



trouble. Perhaps the cut-out points are poor. Hold the points together while the engine is running and the lights are on and watch the ammeter. If the ammeter needle ceases to jump back and forth, but indicates a charge as it should, then put in a set of cut-out points or face them off so that they will contact properly.

The cut-out points should close at a speed corresponding with a car speed of from 10 to 15 miles an hour. They should open as soon as the engine speed drops down to this figure. See if this is the case and if it is not, then look to the cut-out armature spring. Give the spring tension enough so that the points will not come together until the engine is running at, say, 12 miles per hour. And when the points come together watch the ammeter and see that it jumps forward toward the "charge" side and not backward. If it jumps backward increase the cut-out spring tension.

See that there are no loose connections or short circuits between the cut-out and the generator, also see that the cut-out is properly grounded. If, after making these experiments and adjustments you will write us again, telling the results, we will try to help you further.

Wiring of Moon 1920

3111

From M. T. Cullen, Pennsylvania.—I should appreciate it if you would kindly publish a diagram of the wiring used on the Moon 6-68 1920 car equipped with the Delco system.

Reply:—The diagram which you request is printed on this page.

Light Motor Supports

3112

From Zolo V. Lester, D. C.—I have had considerable trouble with my Chevrolet motor in that the clutch continues to work out of alignment. I would like to know what you think of the "Dunn Support for Chevrolet Motors?"

Reply:—In many of the light cars, the Chevrolet 490 for instance, there is a tendency to make the rear engine supports as light as possible and in many cases, where the cars are put to severe strains, the engine supports sag and bring the parts out of line. There is also a tendency for the frame to buckle downward at the supporting points and thus throw the engine out of line.

It might be argued that where the transmission and engine are bolted together a slight sag in the support would not cause trouble, however, this is not so. Any change of alignment from normal will result in a strain, especially if the propeller shaft has a fixed length. In such a case the thrust or pull is exerted equally upon or against the rear axle and the transmission.

Since the frame is designed to carry the strains it is only logical that the engine be firmly fixed to the frame. If the regular supports do not accomplish this, then auxiliary supports should be installed. It is not wise to depend upon the engine-transmission flange bolts to take the strain and keep the parts in alignment.

We feel that you will be entirely justified in installing a Dunn support on your Chevrolet 490 car, particularly in view of the fact that you have already experienced some trouble caused by mis-alignment of parts.

Installing Baffle Plates

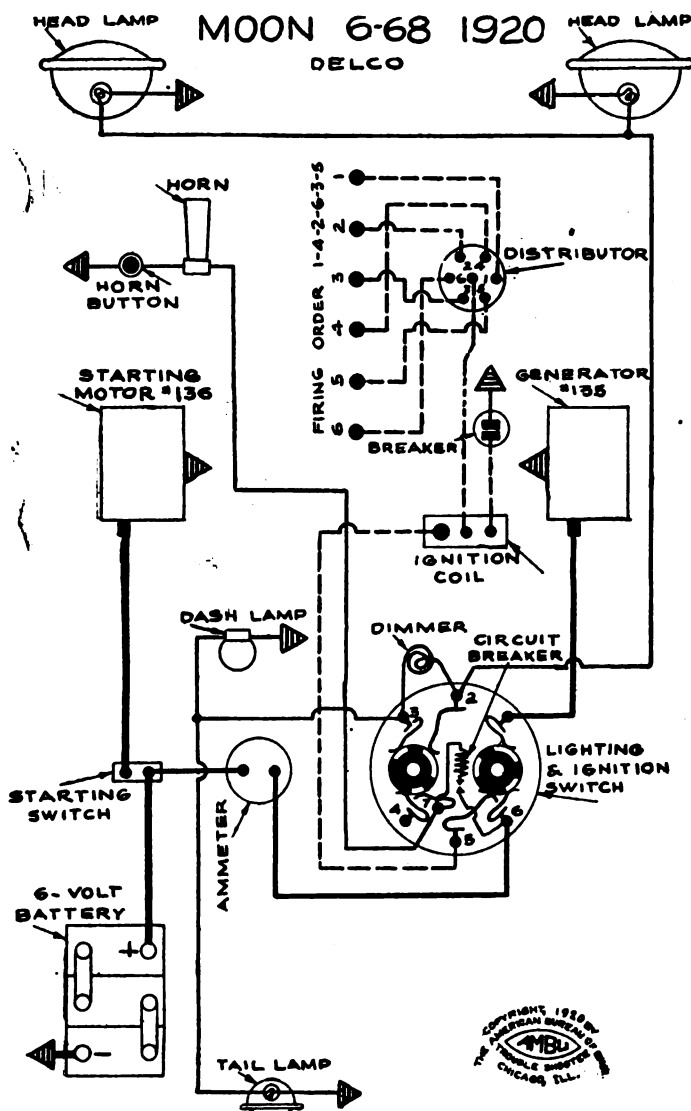
3113

From V. R. Chawning, Virginia: I have a model 34 C Oakland car which is giving trouble by pumping oil past the pistons. Do you think it is advisable to install baffle plates? What is your advice in the matter?

Reply: We have always contended that a verticle type of engine should not pump oil into the combustion chamber if the pistons and rings fit the cylinders properly.

As a matter of fact there is absolutely no reason why oil should get into a gasoline engine firing chamber. Goodness knows it is a difficult matter to keep any pump working under the best of conditions and yet it seems a perverse fact but oil will get into the top of the engine.

Three of the four strokes tend to drive the oil out of the explosion chamber and only the intake stroke has the



N22666

opposite tendency. In our opinion the piston rings are not properly fitted in the majority of cases. The repair man is prone to put the rings in place and get things together again hoping that sooner or later the rings will "wear in."

Such a repair man is much like the cubist who throws a lot of messy colors upon canvas, gives the thing a name and hopes that someone will see "art" in his work or be decent enough to "understand."

Our honest opinion is that you should either fit new rings or have new ones really fitted. See that the rings fit not only the cylinders but the piston ring grooves as well.

In the past we have often recommended the use of baffle plates but we have made that recommendation in connection with V type engines. However if you cannot find a repair man, who really knows his business in your town you might try baffle plates between the cylinder block and the crank case.

Baffle plates should be installed low enough to escape the piston skirts and have a slot cut wide enough to admit the connecting rod. They should also carry three or four holes around the edges to drain off the oil.

If the pistons in your engine travel below the block it will be a difficult matter to install such plates. In such a case it may be of advantage to put a baffle plate at the left side (facing the car) so that the normal splash from the connecting rod will hit against it and be deflected downward.

Velie 34 Wiring.

3114

Burton J. Huntley, Connecticut—I would like to have the wiring diagram of the Velie 34 car.

Reply:—The wiring diagram of the model 34 Velie, years 1920 and 1921, Westinghouse system is reproduced on this page.

Oil Pumping

3115

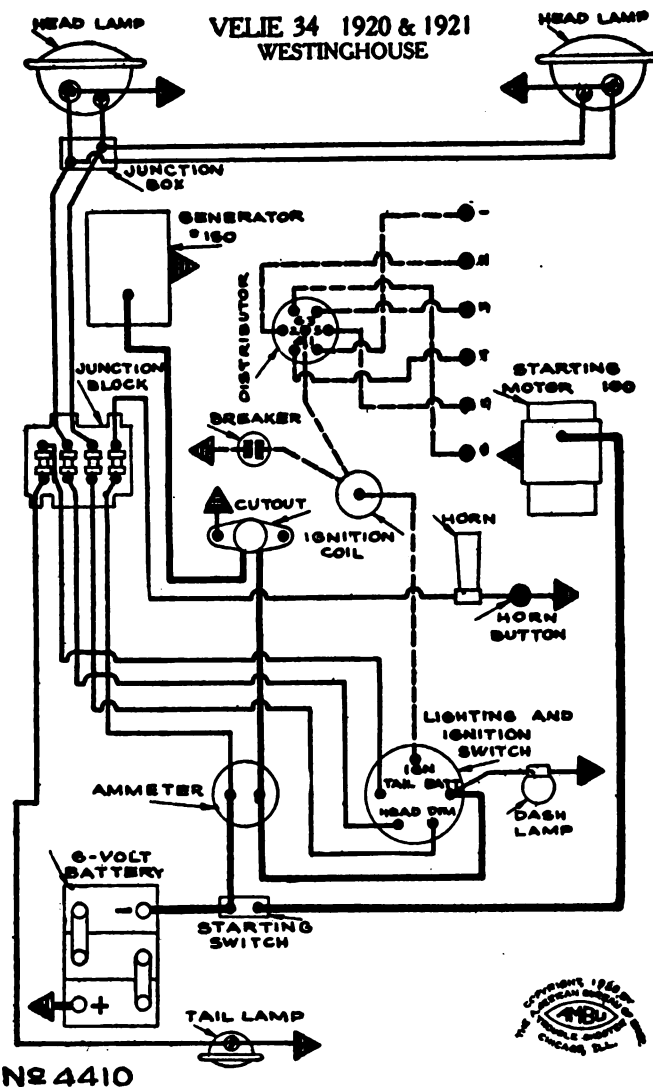
From A. B. Setzler, South Carolina:—I have a Mitchell, 1920 car which has been giving trouble recently. Although this machine has but recently been fitted with new rings it seems to pump oil and foul the plugs so that it requires cleaning every few days. The fuel seems to work down into the oil base. What is the trouble and how can things be fixed?

Reply:—The trouble evidently is due to improperly fitted rings. Many people believe that so long as a ring fits the cylinder and has the proper end clearance it must be correctly fitted. This is not the case, however, for there are other important points to be considered. In many cases a ring which fits the cylinder will pump oil faster than one which does not. This fact appears strange, but it is true.

If there is the least bit of play in the ring, between the ring and the groove, it will work up and down with each movement of the piston. When the piston goes

down on the power stroke the ring will be scraped up to the top of the groove and leave an open space at the bottom. Through this open space the oil will splash or work into the chamber back of the ring. On the next up stroke, (exhaust), the ring will be pushed back to the bottom of the groove, trapping the oil just like a valve.

On the intake stroke, at the start, some of this oil will be sucked into the cylinders and the balance trapped back of the ring while more will be added as the piston descends. For the first part of the compression stroke there



N24410

is just enough suction in the cylinder to draw up more of the oil. The oil is just heavy enough to be self sealing to a certain extent and thus tends to "pump" upwards.

Not all engines pump upwards, however, crank-case compression varies in engines and so does compression chamber pressures. Many engines tend to pump downwards and run comparatively free from oil troubles. The obvious remedy for the trouble is to fit the rings to the grooves and to provide the lower ring groove with a scraper ring or a set of drainage holes.

Present day fuel tends to work into the oil base and we know of no way to prevent it.

Wiring of Saxon 1916

3116

From W. O. Mintner, Colorado.—I am having trouble with my Saxon 4 1916 and would thank you to publish a diagram of the wiring used on this car so that I may trace it through.

Reply:—We are printing below wiring diagram of the Saxon 4 1916-1917 equipped with the Wagner System.

Ammeter on Cadillac 1912

3117

From Ernest Rasmussen, North Dakota:—I would like to know if an ammeter can be connected on a 1912 Cadillac to show charge and discharge. I would also like to know if the main bearings on a 4-90 Overland can be taken up.

Reply:—There are three posts on this generator, (1912 Cadillac, Delco), and they should be numbered, 1, 2, 3; 1 and 3 being the outside posts. Terminals 2 and 3 connect with the cut-out, while terminal 1 connects with the voltage regulator.

With these older types of generators, when repairs have been made, it is not always possible to be sure of the wiring; but if the original wiring is as originally planned, the ammeter may be connected in the line from the second, or middle terminal of the generator.

If the ammeter does not register correctly with these connections, try it in the circuit between terminal 3 and the cut-out. In testing the ammeter put it in the

circuit as indicated above and turn on the lights. If ammeter shows "discharge," then it is apparently properly connected. In this case the engine should be started and the lights turned off. Ammeter should then show "charge," (from 5 to 10 amps.).

If, however, the ammeter shows "charge" when engine is stopped and lights are on, simply reverse the ammeter connections.

If ammeter shows no reading when engine is stopped and lights are on it is in the wrong circuit, though it is possible that it will read correctly after the cut-out points have closed. Put it into the other circuit (connected with terminal 3).

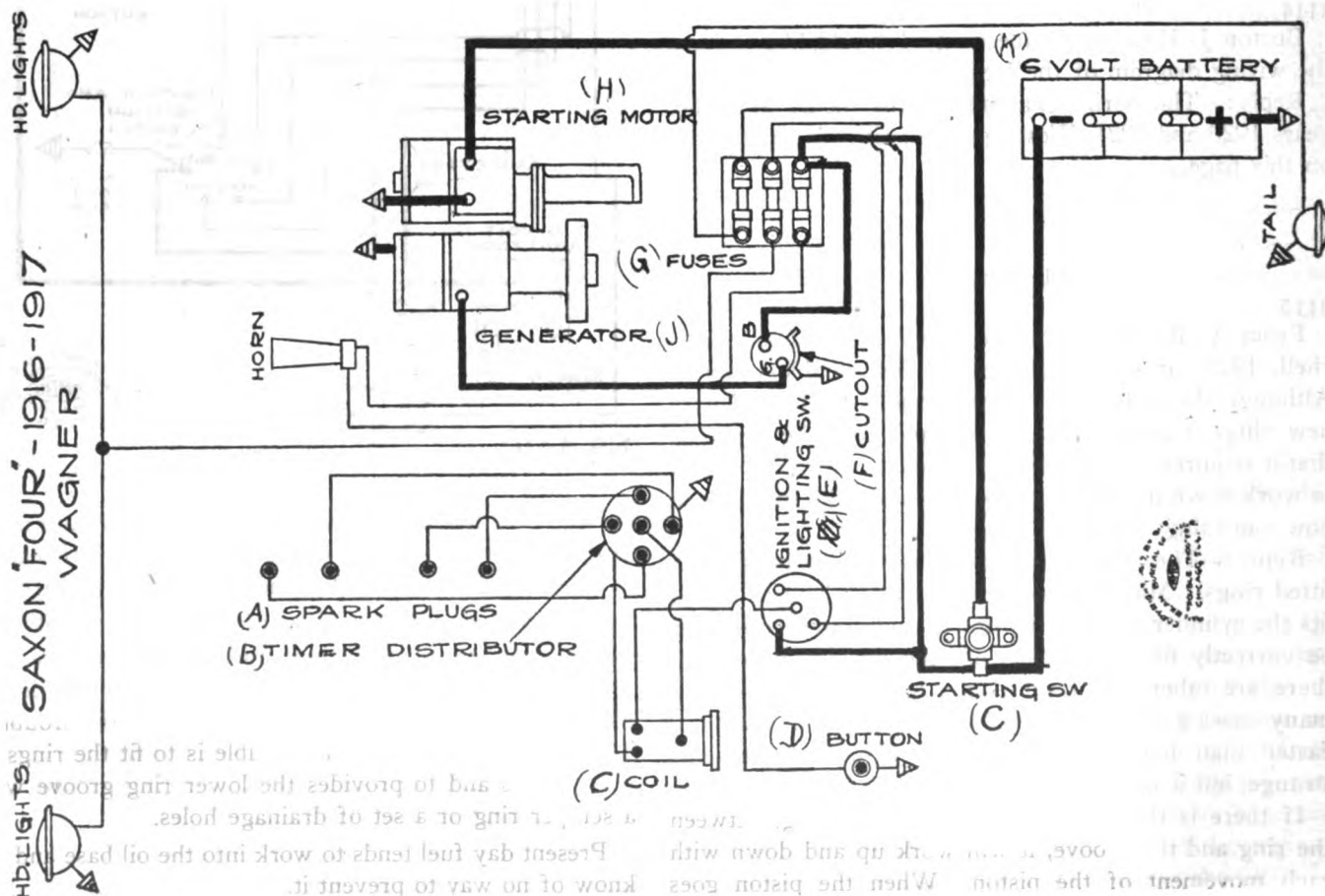
Do not, under any conditions, put the ammeter between the battery and the generator or between the battery and the ground or it will be burned out when the starting motor is used.

It should be an easy matter to adjust the main bearings on the Overland car. Simply remove the oil base, take out the two cap screws which retain the main bearing cap and remove one or more shims until the cap clamps fully against the crankshaft. Do not get the bearings too tight and remember that the caps should rest upon the shims and not the journal of the shaft.

With some people charity begins at home, but it never gets as far as first.

* * *

Envy is the tribute that failure pays to success.





Graphite in the Crankcase

From Wm. Brenner, Jr., New York:—Can you tell me if there is any danger of damaging the magneto of a Ford truck if graphite is mixed with the oil in the crankcase? Will it be advisable to feed the graphite through the carburetor?

The water in my storage battery ran very low a short time ago and the battery would not operate the motor. Will the addition of distilled water correct the trouble or is it better to have the battery charged?

The battery is only three months old and the terminals are covered with a green substance; what is this stuff and how can I prevent it from forming after the terminals have been cleaned?

Reply:—It is not advisable to put graphite into the Ford crankcase because there is a good chance that the magneto will be short circuited. In any event it is likely to short circuit the magneto contact brush.

We published exactly this same reply about a year ago and although we made no further mention of the fact we were severely criticized for making the above statement. The manufacturers of the product Oildag and Gredag claim that their graphite oils may be used in the Ford engine without damaging the magneto.

We have no case either for or against these manufacturers, nor are we in a position to know whether or not their graphited oils will cause trouble in the Ford magneto. We do know that the two products mentioned are excellent lubricants and that it was not our intention to say that graphite, in the form which they manufacture it, would damage the Ford magneto.

Our statement is that it is inadvisable for you to mix flake graphite with lubricating oil for the Ford engine. You may feed flake graphite into the carburetor or air intake and a limited amount of graphite, fed in this way to the engine, is advisable. The graphite tends to fill cylinder scores or scratches and increase compression.

You will find it necessary to clean the plugs a number of times after feeding the graphite into the engine; a bit of trouble perhaps, but the results are worth it.

Put distilled water into the battery immediately so that it covers the tops of the plates and is level with the lower edge of the filling tube. If the charging rate of the generator is sufficient and most of your driving is during the day time it is probable that the battery will be charged in a few days. The hydrometer reading should show between 1.285 and 1.300. Take the reading

after the car has been run for an hour or so and not right after you have added the water.

If you find that the battery will not charge as it should and at the end of a week's time it is still low, better take it to a battery charging station.

The green substance on the terminals is a lead oxide-sulphate compound which is caused by the action of the electrolyte upon the lead terminals in the air. Wipe the terminals clean, or as nearly clean as possible and coat them with vaseline. The vaseline will protect the surface and the green stuff will not form.

Front Wheel Trouble

From Fred G. Sattler, New York:—Will you please tell me how I can overcome the "wobbling" in the front wheels of my Ford car? I have had the axle rebushed with new bearings at the king pin yet the wheels will not keep straight and the vibration works back to the steering wheel.

Reply:—There are a number of possible reasons for your trouble and it will be necessary for you to investigate the linkage and axle very carefully since an error of only a fraction of an inch may cause untold trouble.

In order that you may be able to examine the parts and make the proper measurements and tests you should first jack up the front of the car and support it upon horses or jacks, firmly. Adjust the supports in such a way that they hold up the frame instead of the axle because the axle should swing free.

In the first place the axle should slant backward from bottom to top about $5\frac{1}{2}$ degrees. You remember how the forks on a bicycle slant backward? Unless the axle slants this way the car will be very difficult to steer. ($5\frac{1}{2}$ degrees is equivalent to the position of a minute hand of the clock at one minute past the hour.)

If the "wish bone" has been bent or the springs twisted, the axle may be tipped in the wrong direction. The car will never steer easily until the axle is slanted backward.

In the same way the wheels should slant outward at the top. In words of "one cylinder" the front wheels should be "bow-legged." The wheels should be between $2\frac{1}{2}$ and 3 inches further apart at the top than at the bottom. The wheels should be from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch nearer together at the front than at the back. This last measurement must be made on a line level with the center of the wheels.

there is little lost motion. By grasping the wheels at the top and bottom and watching the spindle you can see if the play is in the king bolt. If there is play at this point you had better put in a new set of bearings.

There should be just a tiny bit of play in the wheel bearings. If the ball bearings are absolutely tight, even though the wheel runs smoothly, there is danger of dam-

aging the races, but this play should only be just enough so that you can "feel" it.

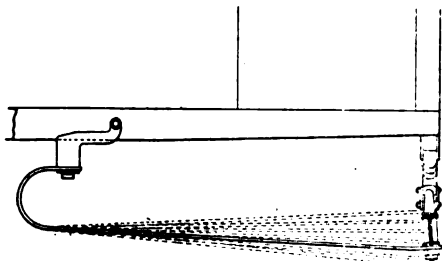
Examine the steering column and the planetary gears just beneath the wheel. The "flare" portion of the column is often riveted to the column and is the part which carries the internal gear. If this part works loose on the column or the column works loose on the dash board it will cause trouble such as you mention.

Special Ford Accessories

The Perfect Strut Rod

On another page of this magazine a reader has complained that he is having much trouble with the steering gear of his Ford car. This reader's trouble is not unique for it often occurs where the radius rod or "wishbone" is bent or broken. The "wishbone" is one of the weak points in the Ford car.

To obviate all "wishbone" troubles the Strut Rod Co. of Hoboken, N. J. is marketing "The Perfect Strut Rod," which is illustrated herewith.



The Perfect strut rod takes the place of the Ford "wishbone" and is a heavy steel spring which is fastened to the axle at one end and the frame at the other. Two strut rods are used on each car.

The Perfect strut rod is designed of the proper length and is springy enough to take any reasonable strain without breaking and after taking that strain to restore the axle to its proper position.

We reproduce below a testimonial letter which may be of interest to our readers, and is relative to this product. Mr. Morris R. Machol.

The Strut Rod Company,
Hoboken, N. J.

Dear Sir:

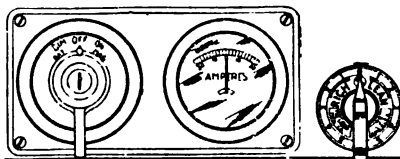
I wish to tell you of the excellent service which the strut rod, which we have placed on our Ford station wagon, is giving. This station wagon is used to transport children and help up and down a steep hill at the Inwood shelter of the Society, 214th Street & Bolton Road. The need for some more substantial support for the Ford car other than the regular equipment, with its so-called wishbone, has been apparent for a long time. We have been particularly anxious to have equipment that we could feel was perfectly safe in the handling of the transportation of children. The Strut Rod has been subjected to a severe test, and I am glad to say that we have found it not only adding to the safety of the car, but making the car easier to steer, more comfortable in which to ride and eliminating vibration. This will undoubtedly help to lengthen the life of the car.

(signed) Ernest K. Coulter,
General Manager.

The New York Society for the Prevention of Cruelty to Children.

Labro Gas & Battery Saver

A device which is claimed to be a battery saver because it lessens the drain on the battery due to the fact that it makes Ford engine starting much easier



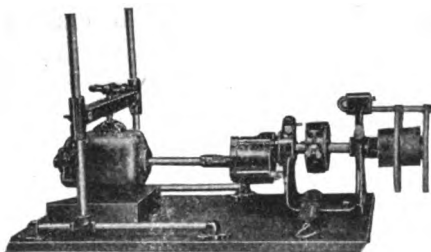
than normal is being sold by The Labro Mfg. Co., of Los Angeles, California.

The Labro Gas & Battery Saver, as the device is called, is so designed that it takes the place of the regular needle valve control on the dash board of the Ford car. It is calibrated as well as marked with the words "Rich" and "Lean."

In making the installation, the carburetor is first adjusted so that it will operate the engine at the lowest possible speed on the leanest mixture possible. The device is then set at zero. Then when the engine is running at high speeds the device may be turned, in a second, to a lean mixture; if the car is being driven in traffic it is but a moment's delay to throw the indicator over to "Rich" and there is no danger of stalling the engine.

Low Priced Electrical Test Unit

A low priced and extremely practical machine for testing Starters, Generators and Magnetos has been perfected by the



Reliance Battery Products Co., 2297 South 8th St., Council Bluffs, Iowa.

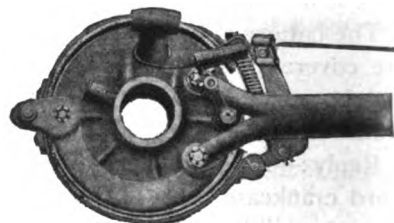
This machine is said to make it possible for the repair man to repair and test without going to the trouble of installing in the car each time a test is necessary. The chief features of the Reliance Test Unit are low price, simple construction and general adaptability to the needs of the average shop. It has a special feature in that Ford F. A. generators mesh directly into the drive and can be turned at any angle while under test, so that adjustments can be made without removing the generator from the test unit.

A. C. Brakes

A brake which will stop the Ford car without jar and chatter is the quest of every Ford car driver. The regular, rear braking system on the Ford leaves much to be desired and there is much room for improvement.

In introducing the A-C brakes, made by the A-C Manufacturing Co. of 2259 West Grand Ave., Chicago, Ill., the manufacturers claim that this brake will meet all expectations.

The A-C brake is designed to be attached to the regular Ford axle and



when installed is an external contracting unit. The device is operated through a steel cable which has an equalizing lever so arranged that both brake bands exert the same pressure on the two wheels.

The brake is attached to the regular Ford brake pedal and the makers claim that only about one hour's time is required to make the installation.

Burke Retainer

The Burke Manufacturing Company, Dayton, Ohio, is putting on the market a grease retainer for which the claim is made that it will positively stop the leakage of grease on the rear axles of Ford cars.

This new retainer is as simple in construction as it is practical in use. It is made of accurately machined parts of bronze and steel with a non-absorbent cork packing that insures a tight and permanent leak-proof job.

One of the features of the Burke Retainer is the center bronze sleeve which floats with the side play of the axle. Another exclusive improvement is the lug which fits the keyway of the wheel to keep the sleeve turning with the axle.

With the use of this retainer the grease is said to be shut within, not away from, the bearings, and to allow the differential gears and bearings always to be flooded with the lubricant, at the same time keeping the brakes and tires dry.

It is easily and quickly installed and no special tools and required, nor does it in any way change the standard Ford construction.

It is sold by the manufacturers on an absolute guarantee that it will do the work regardless of the condition of the car on which it is placed.

New and Useful Automobile Accessories

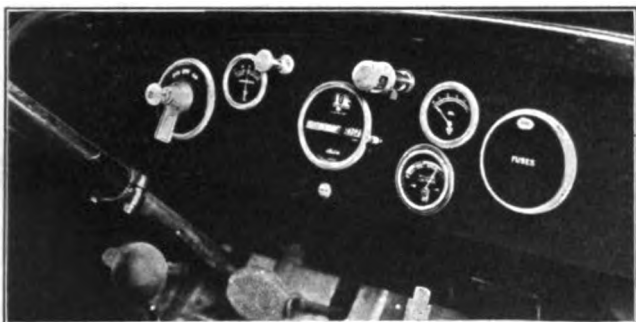
Borg & Beck Heat Indicator

The temperature of an engine might well be compared with the temperature of the human body in that it reflects the condition of the whole machine. Practically any dangerous condition such as lack of oil or water, excessive friction, poor circulation or carbon formation will affect the temperature. It follows that a temperature indicator is as essential as an ammeter or speedometer.

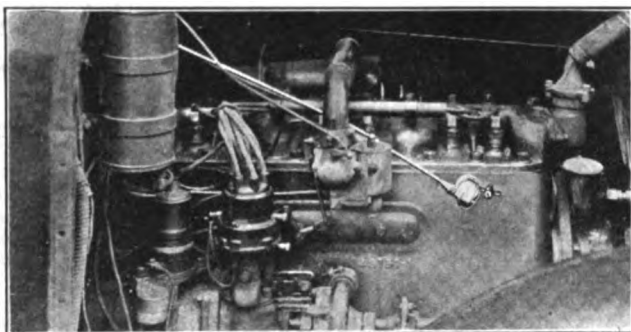
We call the attention of our readers to the heat indicator being made by the Borg & Beck Co. of South Michigan Ave., Chicago, Ill. This indicator is

The indicator on the dash has five markings; "Cold," "Cool," "Efficient," "Hot" and "Danger." In installing the unit the pointer is set to the proper indication and thereafter it will indicate the proper temperature.

Since the difference in temperature of the engine between "cold" and "efficient" may mean quite a few miles more or less to a gallon of fuel it follows that the device might well pay for itself in one season. The operator can watch the indicator and if the engine is running too cool he can cover the radiator partially, or if the engine is running too hot he is warned to investigate before any damage is done.



Instrument Board Installation of the Borg & Beck Heat Indicator



Installation of the actuating unit of the Borg & Beck heat indicator on motor

particularly interesting because it will reflect the temperature of the engine rather than the radiator, and it is the engine temperature which is most important.

The Borg & Beck heat indicator consists of two units, the thermostat and the dash indicator and the two are connected by a flexible shaft.

The thermostat or actuating unit is made of aluminum which has high heat conductivity and thus the unit will respond, almost instantly, to any change of temperature. Two leaves, one of nickel alloy, the other of bronze are fused together. A variation of temperature causes this unit to "warp" or bend and in so doing the actuating unit is operated. Through a system of arms and gears the movement is magnified and carried through the flexible shaft to the indicator on the dash.

Presto Chemical Fire Extinguisher

A great stir has been made in the automobile accessory trade by the Presto Fire Extinguisher Co., of Beacon, N. Y. This company is offering \$1000 reward to anyone who can prove that there is any better fire extinguisher in the world than the Presto and this applies to either liquid or dry extinguishers.

This extinguisher is guaranteed to put out all kinds of fires without injury to the finest fabrics or most delicate parts of machinery. It is claimed that it will not lose strength or deteriorate—will not explode or cake—will never freeze—will not evaporate or corrode and does not have to be recharged and it will withstand any climate.

The manufacturers also state that it is non-poisonous, absolutely harmless to flesh or anything it may come in contact

with, except fire, will not stain the finest materials, wall-papers or colors, and in fact, it is stated that the chemicals used in Presto may be eaten or thrown on the body without injury. Nevertheless, this extinguisher will put out any kind of fire in its incipency, even fires that many liquid extinguishers cannot put out.

The manufacturers are putting on the market two forms, one the household fire extinguisher, selling for \$1.00, postage prepaid, in the United States or Canada. They are also marketing an automobile extinguisher which is neatly covered with leather and this extinguisher for use in limousines or coupes is sold for \$2.00, with a supporting bracket. Either of these extinguishers will be sent, postage prepaid, on receipt of the price and the best way for the reader to try out the Presto fire extinguisher is to slip a \$1.00 bill, or if the automobile extinguisher is desired \$2.00 should be sent direct to the manufacturer at Beacon, N. Y.

This is a proposition for direct mail order sales and good agents are wanted throughout the United States. The manufacturers offer special inducements to agents, and anyone who is interested should get in touch with them immediately, as this is a quick selling article and many agents are making big money.

In writing to the Presto Fire Extinguisher Co., do not fail to mention the AUTOMOBILE DEALER AND REPAIRER.

Victor Leather Fan Belt

The policy of making good on products which do not give satisfactory service is being adopted by practically every reliable manufacturer. The manufacturer cannot always be sure of a quality product in every unit which he sells because so many things enter into its construction. Consequently there is an ever increasing trend toward the guaranteeing of automotive products which makes for the protection of the consumer.



A typical instance of this is the guarantee put on the Victor leather fan belt by the Victor Sales Co. of 6523 Euclid Ave., Cleveland, Ohio. The Victor Sales Co. guarantees the Victor fan belt against defects in material and workmanship and states that they will replace, free of charge, any belt or belts that open at the lap or stretch beyond the point allowed for take up on the car.

The Story Of Miller Products

On the back cover of this issue of the *Automobile Dealer and Repairer*, our readers will notice an attractive announcement in two colors, from the Miller Oil Products Corp., of 175-189 Miller Street, Newark, N. J. Every automobile merchant, public garage owner, repair shop proprietor or car owner should be interested in the products which are now being put out by this enterprising company, as these products have been thoroughly tested and they are said to be chemically and practically correct for the various purposes in the automobile industry for which they are especially manufactured and compounded by experienced scientific chemists.

Miller products have not been available in small containers for quite a period of time due to the fact that the Com-

pany was reorganized and moved into the new plant in Newark, New Jersey, and devoted their sole efforts to the production of the bulk goods. Having reached a production point where this branch of the business was satisfactorily handled, the Company is now expanding and in a position to handle package goods business. Therefore, "Miller is back again, with Miller Quality."

Twelve items are offered in package goods and six more items are about to be added for the fall trade. Those now receiving the concentrated efforts of the sales force are those shown in the current retail catalog.

The personnel of this company is that which formerly operated the Frank Miller Company of New York City. Mr. Miller the president of this Corporation was former president of the other concern and is surrounded by Thos. J. Lee, Louis Grumback and Geo. E. Hudson, all of whom are well known to this industry, and former officials of the Frank Miller Co.

The company's works consist of a group of four buildings on Miller Street and Avenue "A" Newark, New Jersey, and a new building is about to be added for further expansion of the package goods trade. The plant is a modern fireproof structure fully equipped with sprinkler systems and modern safety de-

VICES. The company also maintains a garage from which its cars are operated. A complete repair shop for the overhauling of the Company's machines is also included. A research laboratory is conducted by Dr. Robert Clarke and it is the Company's intention to bring out from time to time new products provided such can be created as will be meritorious. Of course Miller Dressings are known throughout the World and they have been produced for eighty-four years being originally manufactured by Frank Miller in Warsaw a small town in northern New York State. He was the great grandfather of the present president of this Company.

The Company has a sales force of sixty-eight traveling men and is maintaining a sales policy of strict protection to the trade and has contracted its entire export volume to the firm of W. & A. Leaman of New York City for the current year.

One of the new products which the Company has developed and is just marketing is a new lubricating oil worthy of mention. This is known as Everlasting Oil and is a high grade lubricant of light body and gravity with a viscosity or stringiness which makes it almost impossible for this oil to drip. It is of great value for use in pressure-gun lubricating systems where an ordinary oil is not of sufficient body to remain in the bearings and where a grease does not contain sufficient lubricating properties. It can also be used in the differential and transmission as it will permeate thoroughly through the bearings and is claimed not to have a tendency to run out.

The leather dressing needs no mention as it has been known to the trade for a great many years. This company claims that it is, today, the only one in its field which has mastered the secret of successfully mixing and compounding oils and water, and as a result able to create many dressings, one of which is the Mohair Top Dressing, which contains water as the principal solvent. This is said to eliminate the risk of destroying the rubber insert in the mohair top such as is caused by turpentine and alcohol.

Another new item which the company is producing which is an entirely new departure is a valve abrasive which the Company calls its new method valve compound. This operates on an electron principle the abrasive being the finest grade of carborundum. Only one grade is produced as this, due to the electro decomposition processes, will work a badly pitted valve with the utmost speed consistent with unscathed surface. This is claimed to be the first time that Dynamic Molecular grinding has been successfully attempted.

Mr. F. A. Miller, President of the Miller Oil Products Co., has kindly furnished us with the following very interesting historical sketch.

"The first leather dressing was manufactured in the year 1838, by Frank Miller, great-grandfather of the president of this Company, who made his own leather dressing on the kitchen stove, in Warsaw, a small town in the western part of New York. He then peddled his wares, being his own salesman for about five years. At the end of this time he took in a partner and built what was then called a modern factory at 18-20 Cedar Street, New York City.

"The business grew steadily and just prior to the Civil War the company was

enlarged and Frank Miller took his two sons into partnership with him. Senator James L. Miller, was one of the boys and the other was Edwin M. Miller.

"The volume of business was increased during the Civil War and the company opened a branch factory in Buffalo, and also in Toronto.

"In 1892 the business incorporated and it was at that time the sixth largest industry manufacturing in greater New York. The plant was on 26th street between 8th and 9th Avenues, and here products were manufactured which made another fortune for the company, during the time that the horse was at the height of its popularity. Miller Harness Dressings, Harness Oils and Saddle Soap became known throughout the world.

"With the automobile becoming an established factor the call for the company's products was again increased.



"Prior to 1838, all forms of leather goods had been treated by oiling the leather to keep it soft and pliable. The first leather dressing was in the form of a shoe paste, very similar to that sold today. This has grown in volume, until practically everyone has something on their person which is dressed with a Miller product: Leather pocket-books, eyeglass cases, shoes, belts, and so forth, while the largest single trade supplied is that of the automobile manufacturers, and body builders, for use on cushions, straps, tool bags, and other items carried in the modern day motor car.

"Whenever you sit in leather upholstery, whether it be in a chair in your club, in a smoking car, or in an automobile, you are probably sitting on a Miller Product.

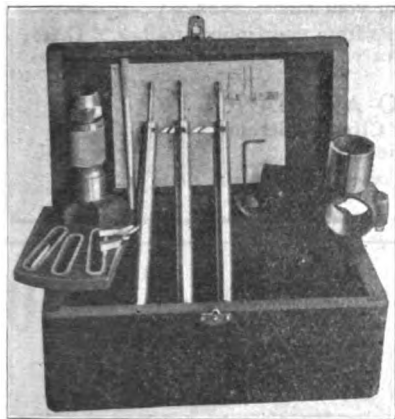
"The outgrowth of all this was the organizing of the Miller Oil Products Corporation in 1920."

Readers who are interested should write to the Miller Oil Products Corp., 175-189 Miller Street, Newark, N. J., for literature and full particulars, and jobbers and dealers should write for terms and trade discounts. In all correspondence kindly mention the fact that you saw this article and the advertisement of this company in the *Automobile Dealer and Repairer*.

The Davis Valve Reseating and Boring Tool

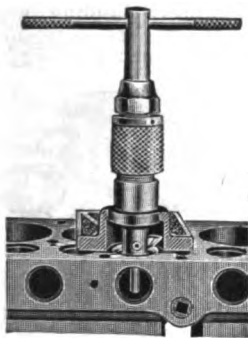
The Hinckley Machine Works of Hinckley, Illinois is selling a tool which should not only be in every repair shop but is well within the reach of the car owner's pocket book. This tool is designed to reseal and, if necessary, bore the valve seats to a larger diameter.

A feature of this device is its feed and



bearing construction. The boring arm is mounted upon a base which clamps rigidly to the cylinder block and is held mechanically upright by large bearings in the body of the tool. The boring bar, though fitted with a pilot shaft, does not depend upon the pilot either for rigidity or support, the bearings in the body holding it in its correct position.

The tool is held to the cut by a screw feed device and the makers claim that there is absolutely no chance for dig-



ging, sliding or chattering. Not only will the device true up the valve port but since it carries a high speed steel cutter it will cut the ports to an oversize if desired.

In addition to its application to practically all types of side valve engines with removable heads the machine has a device for taking care of Buick valve cages. The machine is operated by hand.

Jon-Con Tire Protectors

We are in receipt of a Jon-Con tire protector in our Experimental department and although we will give an extensive report at a later date, after we have had time to test it, we feel that mention might well be made of this product at this time.

The "Jon-Con" is made by the Jon-Con Tire Protector Co. of 2124 North 15th. St., Philadelphia, Pa. and consists of a continuous strip of rubber which is reinforced by heavy fabric. It is de-

signed to be placed in the shoe and around the tube in such a way that the thickest portion of the protector is on the outside.

The rubber in these protectors is extremely pliable and "alive." Our idea, upon first examination, is that these protectors will prevent blow-outs. It would seem that with such a protection there should be little or no chance of punctures.

And when blow-outs and punctures are eliminated it is no exaggeration to say that over 90 percent of all tire troubles are ended.

Calumet Batteries

We call the attention of our readers to the guarantee which is being put out protecting Calumet Batteries by the manufacturers, the Calumet Storage Battery Co. of 10113 Indianapolis Ave., Chicago, Ill.

This guarantee covers the Calumet batteries for one year from date of original purchase and should the battery fail to give proper service, due to a



fault of the device, it will be replaced without charge.

The Calumet battery is the result of over ten years of experience and the manufacturers have embodied many excellent features in their product.

Sterling Electric Clocks

There is no modern convenience which is utilized quite so much as a clock, for, in America, the minutes are worth money and the American is usually a slave to time. Many modern timepieces lose their efficiency as soon as they are subjected to vibration, such as is had on automobiles, and there are but few automobile clocks which can be relied upon.

However, the Sterling Clock Co., Inc. of 220 East 42nd. St. N. Y. City is producing a clock for automobiles which has "Sterling" qualities. The Sterling clock is operated by the storage battery and requires no winding. The action of the current is such that the clock is wound automatically once a minute. Under these conditions the driving tension, which really controls the time, is practically constant and one need not worry that the clock will run too fast, when first wound, and too slow when it is "run down." The current used is claimed to be but one ampere hour in six months.

Sterling clocks are constructed to with stand shocks and vibration as well as wide variations of temperature. They may be obtained in a number of styles; black dials and white hands; silvered dials and black hands and with radium treated hands.

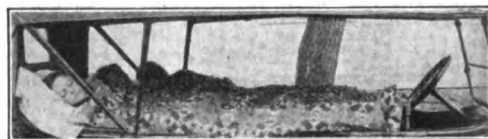


Pullman Auto Sleeping Bed

The Auto Sleeping Bed illustrated was used on a trip to Florida. Mr. Vanderpool and his 4 sons made the trip leaving Springfield, Ohio, January 7; so to speak in midwinter; yet they slept in the car every night. Mr. Vanderpool and his two sons slept on the bed and two of the younger boys slept between the back and front seat below the bed.

They used comforts to lay on the bed and the floor of the car for the little ones. Their route was from Springfield, Ohio to Columbus, Wheeling, Cumberland, Washington, Richmond, Raleigh, Columbia, Augusta, Waycross, Jacksonville, Daytona, Titusville, Palm Beach, Miami, and the way back to Melbourne across to Kissimmee and on to Tampa and St. Petersburg, and we changed our route back.

In arranging a tour this summer,

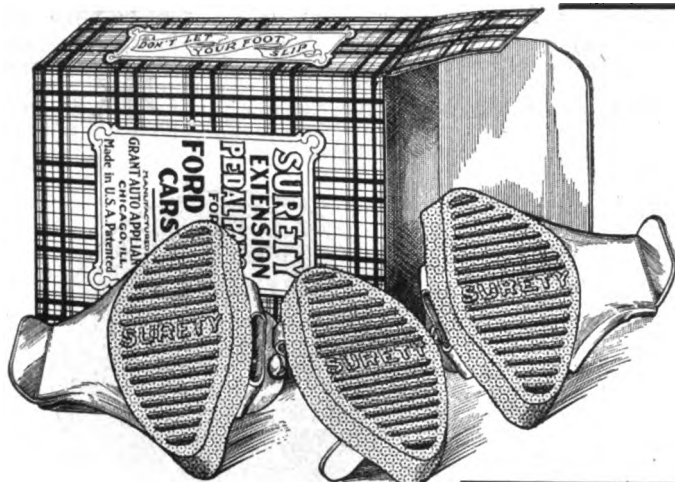


readers will do well to investigate the Pullman Auto Beds. They fold into space 6 inches in diameter and 26 inches long, one has no need of Hotels, or Garage expenses. Pullman auto sleeping beds are made by Vanderpool Company, Manufacturers of Auto Sleeping Beds, Tents, Camp Stoves, of Springfield, Ohio. These beds will enable the car owner to use his car both day and night and make him independent of hotels and garages.

Atwater Kent Increases Output

Demands of automobile manufacturers for electrical equipment from the Atwater Kent Manufacturing Company have resulted in the plant increasing its output from 30 to 90 per cent of capacity in sixty days, according to an officer of the company.

A year ago the plant was on 40 per cent capacity and about 25 per cent four months ago. The Atwater Kent Company expects the automobile trade this year will equal the record twelve months' period in 1919-20.



Surety Extension Pedal Pads For Fords

Here is the greatest value ever offered the trade in a high grade item of real merit. They clamp on over the small Ford pedals giving the driver a wide, comfortable foot hold. Made of steel. Nickel plated, with molded pad of pure red gum rubber. Heavy and dependable and will stay on absolutely rigid. No holes to drill. No alterations. Easiest pad to install.

PRICE PER SET \$1.25

Satisfaction or your money back.

DEALERS get a few sets from your jobber to-day. There is a liberal margin of profit for you and your customers will be enthusiastic over this pad.

GRANT AUTO APPLIANCE CO.

333 South Clinton Street,
Chicago, Ill.

Originators and Patentees of extension pedal Pads for Fords



Get Away from the High Cost of Vulcanizing by using **MAGIC RUBBER MEND**

THE HEATLESS, PATCHLESS METHOD

You can S-T-R-E-T-C-H live rubber. That is why **MAGIC RUBBER MEND** is best for tires and tubes. It does not force the tube to bear additional strain, but it is part of the rubber when it is on. It seals the cuts and tears in a tire, stopping the cancerous growth that leads to a blow-out. There is no puncture or blowout too bad or too big for **MAGIC RUBBER MEND**. Send 25c. for trial package.

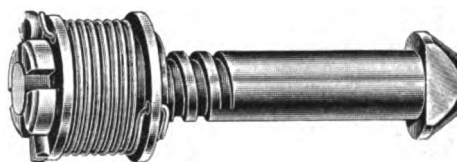
On in two minutes—there forever. Guaranteed to do all we claim

EASTERN RUBBER COMPANY

Department A

Philadelphia, Pa.

AGENTS WRITE



\$3.50 SET

With "NO-KNOCK" AUTOMATIC CONNECTING ROD BOLT you can stop the knock in five minutes.

The "NO-KNOCK" AUTOMATIC CONNECTING ROD BOLT costs a little more than the regular Ford bolts and it does not take a mechanic to install them. The average cost to install new connecting rods in the Ford car is \$15.00, but with the "No-Knock" Connecting Rod Bolt you take out the old bolts and all the shims and insert the new bolts at an expense of \$3.50 and twenty minutes time.

This Bolt does away with the shims, automatically keeps lower bearing cap at proper tension around crank shaft, if babbitt bearing is out of round it automatically wears it back round, by doing away with the shims it allows the oil free access at all times to receive plenty of oil on both sides of the bearing.

On demonstration it has proven that by use of a "No-Knock" bolt the connecting rod has run 50,000 miles without any attention and we guarantee these bolts to run and give satisfaction as long as there is a babbitt lining in the connecting rod.

Price, set of 8, With Wrench, \$3.50. Send for Agents' Proposition.

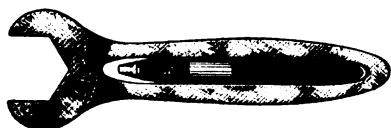
NO-KNOCK BOLT COMPANY

758 Jackson Blvd.

Chicago, Ill.

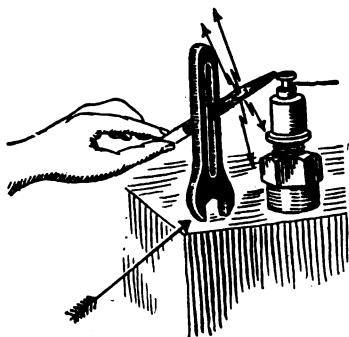
The C. T. H. Plug Tester

Since the majority of automobile troubles may be traced to the ignition system it follows that the spark plugs are the first units to be tested in case of any engine trouble. To facilitate the



testing of spark plugs and at the same time provide a tool for the removal of the plugs, the Maxwell-Brown Co., Inc. of 334 Fifth Ave. N. Y. City, is marketing a combination plug tester and spanner wrench.

This device is termed the C. T. H. Plug Tester and as a wrench is de-



signed to fit standard spark plugs. The handle is mortised out and mounted on a swivel at the center, is a hard rubber pencil which carries a spark gap. When

used for testing the plugs the pencil is swung to an angle with the wrench and its tip placed against the plug. The wrench makes contact with the cylinder head. The intensity of the spark in the gap indicates the condition of the plug and the amount of current passing into the electrodes.

E. G. Products

The E. G. Manufacturing Co., Inc. of 250 West 54th Street, New York City, are offering several Standard Automobile Accessories familiar to Jobbers and Dealers at prices which certainly appear interesting. One of these is the Efemco Timer.

This Timer has been on the market for several years. The special features include a scientific design, provision for proper lubrication, thereby reducing wear; tempered steel contacts pressed in a fibre ring, which it is said cannot warp, and a heavy stamped steel case. The Roller has a large Coil Spring assuring close contact and a hot spark giving more power to the motor.

They are also offering a Toggle Valve Lifter, which is especially adapted for 8 or 12 Cylinder Motors, due to the fact that it is very short and can be used in out of the way places. As the Valve can be raised gradually with the thumb screw, the lifter will hold the Valve Spring securely for any length of time, while the pin is taken out of the Valve or the tappets adjusted. By reversing the action of the lever arrangement, this Toggle Valve Lifter can be used

as a vise securely holding any small articles that one desires to repair.

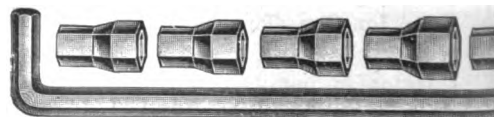
The Socket Wrench Set illustrated is



made especially for Ford Cars, and will fit nearly all of the larger nuts, especially those on the motor, such as the



nuts on the Cylinder Head, Crank Case and Connecting Rod Studs. It will also fit the nuts on the Differential Housing,



etc. The long handle supplied is said to assure a greater leverage. If the straight end is inserted in the socket one is able to reach nuts which are out of the way, as the handle is 8 inches long. The kit supplied is water-proof.

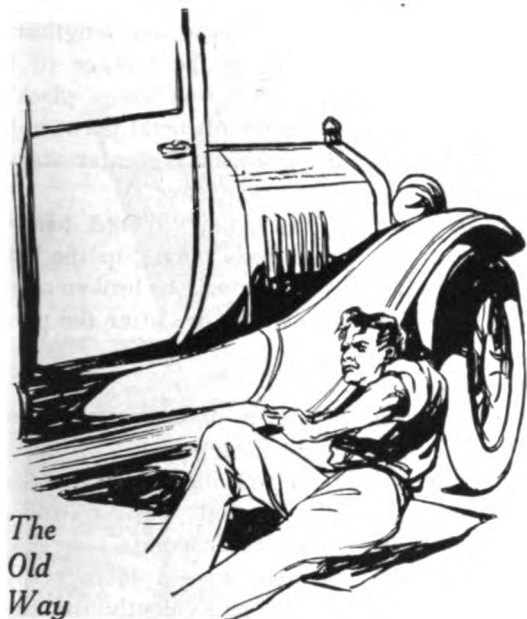
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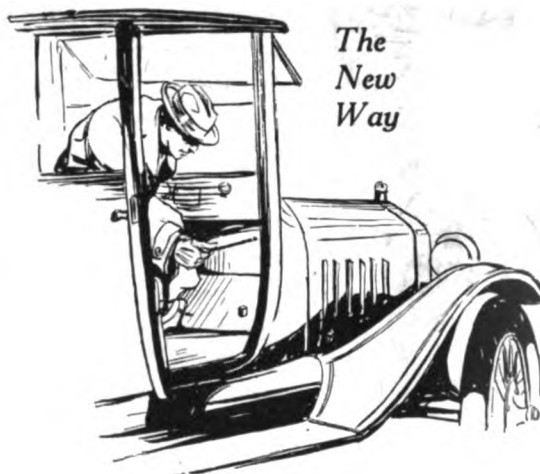
NO DIRT or GREASE

NO TROUBLE



*The
Old
Way*

With
**Schaefer
OIL
WATCH**



*The
New
Way*

ELIMINATE THIS

FORD DEALERS everywhere greet Schaefer Oil Gauge with great enthusiasm. They appreciate its acceptance by the Ford owner as his best assurance against Burned Out Bearings; and as a reducer of expenses, a sure eliminator of trouble and a good preserver of clean clothes. It has many appeals for the Ford owner and these are but a few of the numerous reasons why Schaefer Oil Gauges sell themselves.

ALL OIL TROUBLE ELIMINATED

The Ford owner usually guesses at his oil supply. He just hates to creep under his car with a pair of pliers, twist open the two pet cocks to find out how the oil supply stands. He relies upon guess work and guess work is usually wrong. The result is burnt out bearings and cylinders full of carbon. Show him Schaefer's Oil Gauge which will eliminate all troubles; show him how simple it will be to unscrew the rod from the toe board, lift it up and see at a glance whether his oil is at the

proper level or not. No stepping out of car. No creeping under it. No dirty work and no more oil trouble—the full facts in a few seconds.

EASILY INSTALLED

Installing the Schaefer is so simple that he can do it himself. Simply attach it to the crank case in place of the lower pet cock, bring it up through the toe board and everything is set. No further trouble with oil supplies will be experienced.

ABSOLUTELY ACCURATE

There is no complicated arrangement which can get out of order and mislead him. What is read on the rod is the exact amount of oil in the crank case. The Schaefer Oil Gauge cannot lie because there is absolutely nothing which can get out of order.

DEALERS: You will want to carry Schaefer Oil Gauges in stock so that you will have them when asked for. They retail for only \$2.50. (Write for particulars about our attractive dealer proposition.)

Mail This Coupon Today

Philip Schaefer & Company

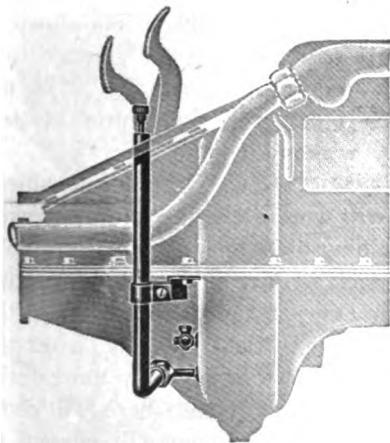
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Or Deteriorate**

Presto CHEMICAL FIRE EXTINGUISHER

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It's a scientific fact that PRESTO is the most perfect fire appliance the world has ever known.

See detailed technical description in the reading matter section of this magazine. It's a demonstrated fact that PRESTO cannot explode or cake—will not evaporate or corrode—does not have to be recharged—will withstand any climate; is non-poisonous and absolutely harmless to flesh or anything it may come in contact with, except fire.

We are now putting on the market for Automobiles—extinguishers neatly covered with leather in any color to match the upholstery in limousines, coupes, etc. The price of PRESTO is only \$1.00 and it is absolutely dependable—always.

PRESTO-EQUIP your home or plant—one in each room. It is the cheapest efficient fire protection in the world.

PRESTO is a separation of the real from the apparent—the permanent extinguisher from the make-shift affair.

Highly recommended by Fire Chiefs everywhere.

Let us prove that we make a much better fire extinguisher but sell it for less. The logical thing to do is to send a dollar bill, or two dollars, in an envelope—or send for more information.

Price for Household Use \$1.00
Leather covered for automobiles, including bracket \$2.00

Presto Fire Extinguisher Co.
Beacon, N. Y.

Liberal discount to dealers.
This article is a quick seller

Good Salesmen Wanted
Write us for particulars



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AD-53 telling about them.

AMBU pioneered the way in the battery equipment industry, developing equipment and appliances from ideas originating in battery repair shops by practical battery repair men.
Acting in the spirit of the times, we are pleased to announce a big reduction in prices, which should permit every garage, service station or any man doing battery repair work to employ the time-saving, money-making advantages of "AMBU" EQUIPMENT.

As an example of the big price reduction—the
AMBU CADMIUM VOLT-METER TESTER
Complete with Leads and Instruction Book which heretofore sold for \$25.00, is Now ONLY \$19.95

The scale of the Ambu Meter shows marked in red the readings that should be obtained when making a Cadmium Test. Shows instantly exact condition either positive or negative plate groups. The instrument also has a voltage range of .3-0-2.8 and 3-0-28 so that it can be used for all electrical work on an automobile where a voltmeter is required, in addition to battery work. It's size makes it handy for portable work, and the case is made of hard rubber and is acid resisting.



In addition to a complete description of modern battery shop appliances, the new Ambu Catalog gives a complete list of cars and their electrical equipment from 1911 to 1923, which makes it valuable as a reference book.

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Desk 3 BATTERY APPLIANCE DIVISION, of
AMERICAN BUREAU OF ENGINEERING, Inc.,
2632 Prairie Avenue, Chicago, Ill.

SPARK INTENSIFIERS

(Continued from page 34)

There is a peculiar difference between high and low voltages in high tension currents; the low voltage current tends to follow the line of least resistance, but as the voltage increases the tendency is not so marked. An instance of this fact may be noted in the fact that lightning does not always strike the highest buildings, or objects, but often picks out a comparatively low spot in the midst of high ones.

The spark intensifier is merely a means for lengthening the spark gap and thus increasing the voltage of the secondary current. The storage action takes place in the coil windings and in the length of metal between the gap and the plug electrodes and has a greater storage action than a single, long gap would have.

The intensified spark, having higher voltage, tends to hop through the air at the electrode points, in the spark plug, regardless of whether the plug may be broken or not. Thus the plug may often be made to fire after the porcelain has been broken or the electrode points "shorted" by carbon or drops of oil.

The writer has made a number of experiments with various forms of spark intensifiers, two of which are particularly interesting. In the first one, a plug was dipped in lubricating oil and removed with a drop of the oil clinging between the electrode points. A simple spark from a coil which normally gave a $\frac{3}{8}$ inch spark did not show at the points at all. Evidently the spark passed through the oil in the same way as it would through any good conductor. By forming an auxiliary spark gap, by holding the secondary wire about $\frac{1}{8}$ inch away from the top of the plug, the spark hopped around the drop of oil.

In the second experiment the plug was covered with carbon scrapings from an engine. A few of the carbon flakes adhered to the electrodes and the normal spark from the coil shorted through them. When the gap was made however, about two out of five sparks hopped around the carbon flakes.

Though an auxiliary gap will not always fire a fouled plug, it may often fire the plug once or twice, just enough to clean the plug from oil and thereafter the plug will fire regularly. If the auxiliary gap is adjusted properly, then the minimum strain will be put upon the coil and for this reason the gap should be cut down to $\frac{1}{64}$ of an inch to start with and gradually lengthened until it does the work required. Naturally it is not advisable to install such a device if the ignition system is functioning normally without it.

There is one caution against the use of such intensifiers. At first any intensifier will work well. But in many cases, after a few hours of running the intensifier causes trouble. The cause for this is lack of air. The secondary current tends to ozonize and then to burn up the air in the gap. After the air is burned, that is to say, after the oxygen is burned, the air offers considerably more resistance to the passage of the current and there will come a time when the coil cannot furnish enough current to jump the gap through the burned air.

The BEST IDEAS in OIL STATION BUILDING

NOW, the individual or oil company contemplating the building of an Oil Station can secure from ONE SOURCE complete PLANS AND SPECIFICATIONS of a modern, up-to-date station exactly suited to their needs and location, ready to turn over to the builder or contractor—

Also the famous and widely used

American Visible Curb Pump

together with the Oil Equipment and everything needed to complete the station ready for operation.

The plans combine the MOST SCIENTIFIC construction with the BEST and MOST ATTRACTIVE designs, including complete details for economical and efficient arrangement of interior fixtures.

We have issued a booklet illustrating a number of designs and explaining how a THOUSAND COMBINATIONS of buildings, interiors and ground plans can be made from our plans.

Ask for Booklet 13-D

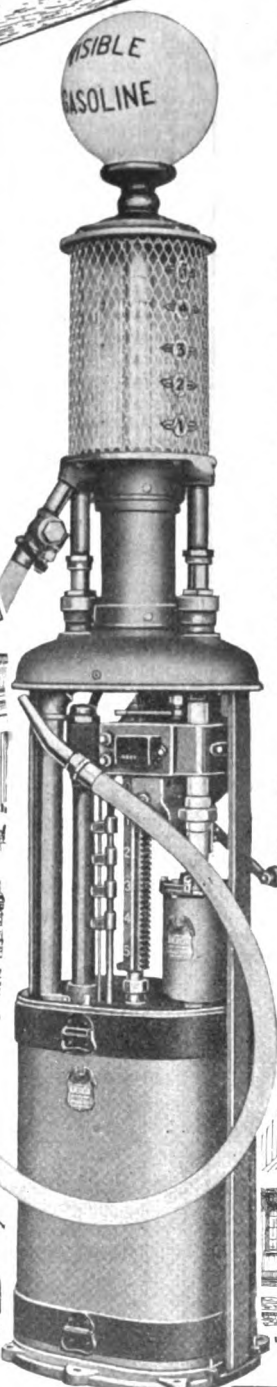
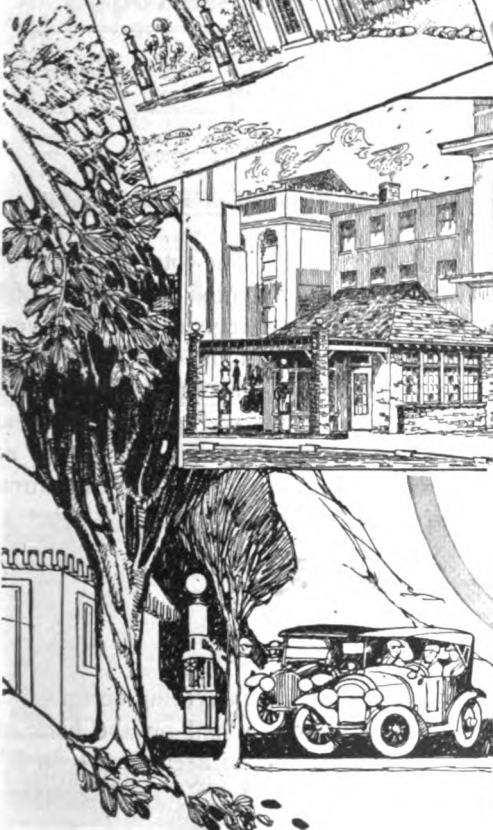
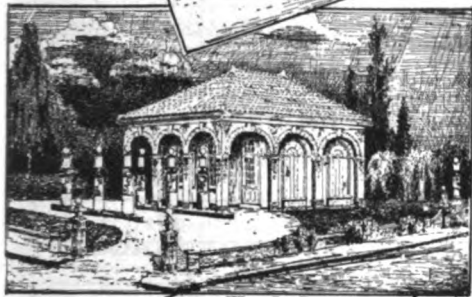
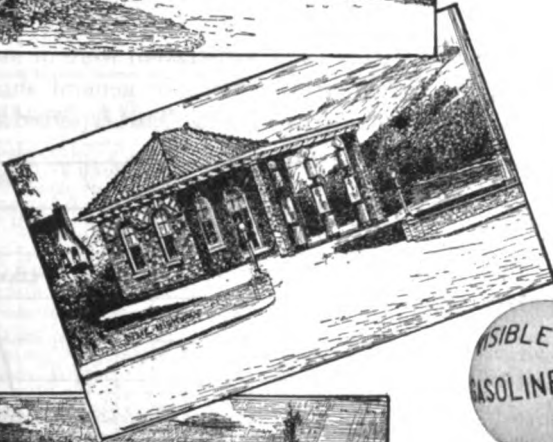
The American Oil Pump *and Tank Company*

1143 FINDLAY ST.,

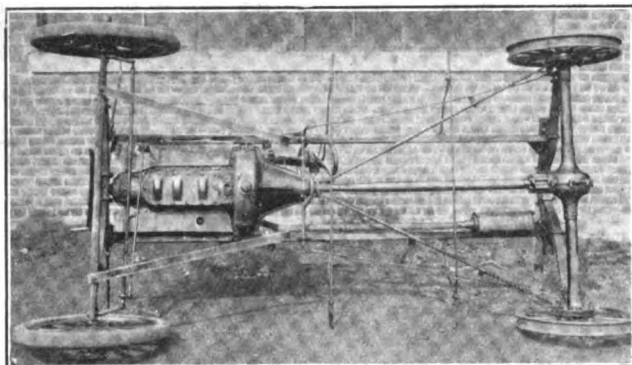
CINCINNATI, OHIO.

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Be sure and specify booklet by number.



THE PERFECT STRUT ROD



Worm's-eye view illustrated above, shows the Strut Rods attached to the frame of your Ford car or truck, and shows that the **STRUT RODS DO NOT TOUCH THE CRANK CASE.**

Patented, November 30, 1920
Ansonia Mfg. Company, Ansonia, Conn.
Exclusive Licensee

THE PERFECT STRUT ROD has a special appeal to women and children—Danger from broken radius rod (termed **WISHBONE**) on your Ford car eliminated—**DRIVE AND RIDE IN SAFETY AND COMFORT.**

PRICE \$12.50 per set

Put On While You Wait

A set is two—one right, one left hand, packed in burlap together with the necessary bolts, nuts and washers, with instruction sheet enclosed. Weight, about 20 pounds.

No Machining—No Drilling Necessary.

SAFETY with SERVICE

The Perfect Strut Rod is a **NECESSARY**, not an **ACCESSORY** and is guaranteed for the life of your car. It means **ECONOMY** in operation, **EASE** in steering, **PREVENTS** cracked or broken crank-cases or crankcase arms. *Saves—Tires, Temper and Time*, and pays for itself in the cost of engine repairs.

The Strut Rod may save your life.

The best test is in the use. A trial test free.

Satisfaction guaranteed or money refunded.

Send your order to

The Strut Rod Sales Company

7 East 42nd Street
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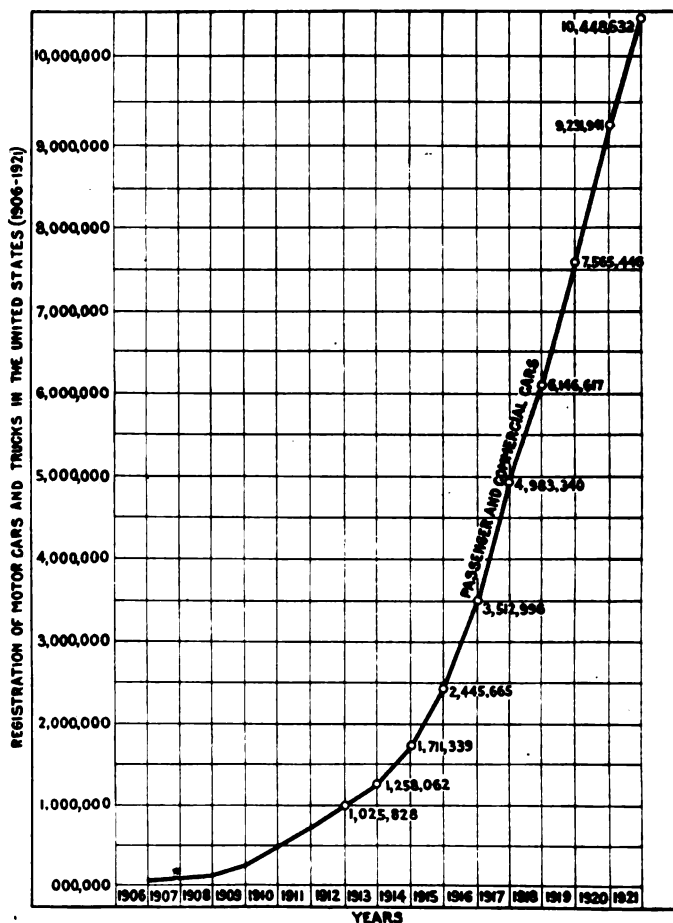
Requests for information, literature and agencies should be addressed to

JAMES M. CARPLES, Manager

AUTOMOBILES INCREASED MORE THAN 1,000,000

WITH returns received from all States, the Bureau of Public Roads of the United States Department of Agriculture reports that the motor vehicle registration for the year 1921 totalled 10,448,632. This represents an increase of more than a million over the 1920 figures, or a number equal to the total number at the beginning of 1913.

The greatest increases in registration were in industrial sections, the agricultural sections in general showing a smaller amount of increase. No State reported a regis-



tration less than the 1920 figures. The total amount collected as fees of various kinds amounted to \$122,478,654.

It had been expected that the registration this year would show a greater falling off in the rate of increase than the figures reported show. The increase this year continues approximately the same average rate that has been maintained for the last seven years and shows no indication of the near approach of a condition of saturation in the supply of motor vehicles.



Easy

"Well, doctor, do you think it is anything serious?"

"Oh, not at all. It is merely a boil on the back of your neck, but I would advise you to keep an eye on it."

—Driver Dan.

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Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange at the uniform price of seven cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than one dollar, however small.

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DON'T LOSE YOUR RIGHTS to patent Protection. Before disclosing your invention to any one send for blank form "Evidence of Conception" to be signed and witnessed. Form and information concerning patents free. Lancaster & Allwine, 212 Ouray Building, Washington, D. C. "Originators of the Form 'Evidence of Conception'."

PATENTS SECURED—C. L. Parker, Patent Attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

PATENTS—Send for free booklet. Highest references, best results. Promptness assured. Send model or drawing for examination and opinion. Watson E. Coleman, Patent Attorney, 624 F St., Washington, D. C.

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Weezy—Squeaky—Springs soon break. Compton Spring Oilers prevent breakage by automatically lubricating spring leaves making smooth riding. Quickly attached without drilling or changing parts. Send \$4.00 complete set eight oilers; Special Ford Set \$2.00. County agents and wholesale distributors wanted. Box 14, Compton Company, 29 Broadway, New York.

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The "Colpin" magneto Recharge for Ford cars clears all "SHORTS" in the magneto coil and Recharges the Magneto to full strength in less than 5 minutes without removing a single bolt or nut "No storage batteries needed," it operates from any alternating current light socket; will also operate from Farm lighting plants, Direct current circuit, storage batteries and dry cells. Nothing to wear out, No up-keep cost. Weight 12 lbs. Used and recommended by Authorized Ford Dealers.

Has high grade tester for testing before and after charging and to find field coil shorts and end play in bearings, charger will clear timer shorts, test wiring system, Starters and Generators, sold with understanding that if the charger fails to do the work and all that we claim of it, we will refund purchase price. Price \$57.50 prepaid. \$30 to \$50 cash with order, balance C. O. D. Cheapest and only successful charger on the market. Order today. Distributors and Agents wanted. Magnetizer Mfg. Co., 146 West Florence Ave., Dept. M-6, Los Angeles, California.

MAGNETO RECHARGER—Fords in car, other on bench, Alternating, Adjustable Amperage 10-35, Tester, Trial, Guaranteed, State Distributors wanted, producers, prices, detail. (Reliable) 426 Mary St., Utica, N. Y.

Auto Mailing Lists

DON'T BE MISLED. But buy Massachusetts Motor Vehicle Registrations direct from the original publishers. Whole State or by Counties, Cities and Towns. 1921 lists. Auto List Publishing Co., 138 Pearl St., Boston, Mass.

Automobile owners lists, any county in state, 1922 registration. Price \$2.50 per M. names and addresses. Buell's, Albany, N. Y.

Ford Starters

SIMPLEX STARTER FOR FORD \$20. Guarantee. Easily installed. Simple, Durable, Satisfy. Secure agency in your territory. Big profit selling them. American Simplex Co., Anderson, Indiana.

Wanted

WANTED—Men with Ford cars to sell Stokes Carburetors. Exclusive territory given. Write for particulars. Stokes Carburetor Co., Inc., Good Ground, Long Island, N. Y.

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For Inventors

INVENTORS—IF YOU HAVE AN IDEA. before spending unnecessary money for a patent, write Inventors & Engineers Consulting Co., P. O. Box 344, Washington, D. C.

Vaporizers

Stransky's Vaporizers saves 25 to 50 per cent gas for ford owners. Gem Rubber Repairer is the quickest and best tire mend. Price \$1.00 a can. Vaporizers \$4.00 each. Both are guaranteed world's best by the makers. Communications promptly attended to. Delivery guaranteed, terms cash, money back if not as represented. Special price to dealers. George H. Erwin, P. O. Box 972, Schenectady, N. Y. Sales Distributor.

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AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice of four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Formulas

New and latest Formula for Anti-Freeze Liquor for Auto Radiators—Cheap. Easy to mix. No chemical action on any metal. No action on Rubber Tubes. Very satisfactory in use. Costs less than 15 cents per gallon. My price, with directions, \$15.00. R. M. Glacken—The Chemist—Baltimore, Md.

EWALD**FOOT ACCELERATOR FOR FORD CARS**

Every Ford Owner needs a Foot-Accelerator. Safe driving demands it. Needs only to be seen to be sold, and any dealer who fails to show an EWALD ACCELERATOR where his trade will see it is wasting golden opportunities for easy sales and satisfactory profits.

The Ewald is unaffected by road jolts and jars.

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Chicago, Illinois.

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Enormous Profits, and Every Sale an advertisement to your business

Ever Last Tube Patch 10c per Box

A full size tube repair kit, containing 30 square inches repair material, a large tube of cleaner cement and metal buffer in the lid. Packed in air-tight screw top cans. Your label furnished in lots of 500. You can order them out in lots of 100 for \$12.75 for the first 100, and a rebate of \$2.25 for printing special labels will be given when the entire 500 are taken. This keeps your stock fresh and your labels clean. The retail price is 50c—your cost is 10c each. Terms, cash with order. Money refunded if the goods are not entirely satisfactory. The livest money maker open to you today. Mail your order and check now. \$12.75 for your first 100 cans.

Ever Last Tread Co., Inc.

128 East N. Y. St.
Indianapolis, Indiana



Manufacturing Co., Inc.
250 West 54th Street

EMIL GROSSMAN
PRESIDENT

New York

The Biggest Values

Ever Offered the Automobile Accessory Trade



No. 1—Timer—2,000,000 in use. Embodies the best features of the highest priced timers.

	List Price	Jobbers Price	Our Price
No. 1 Efemco Timer for Ford	\$1.50	\$.60	\$45.00 Per C



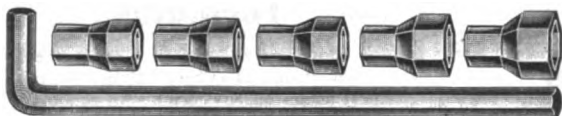
No. 2—Spring Valve Lifter
—Automatic ratchet, leaves both hands free. Nickel polished.

	List Price	Jobbers Price	Our Price
No. 2 Spring Valve Lifter60	.25	19.75 Per C



No. 3—Toggle Valve Lifter
—Operated by a thumb screw. Short, strong and specially adapted for V type motors.

	List Price	Jobbers Price	Our Price
No. 3 Toggle Valve Lifter75	.30	20.00 Per C



No. 5—Wrench Set—5 Hexagon sockets fit 90% of the nuts on Ford and other popular cars. Packed in special water-proof kit.

	List Price	Jobbers Price	Our Price
No. 5 Socket Wrench sets for Ford	\$1.50	.65	35.00 Per C

We are pleased to announce the purchase of the largest quantity of *standard automotive accessories* that was ever offered *at the beginning of the selling season*. It consists of practical tools made by the largest and most successful manufacturer in America—Nationally advertised for three consecutive years and catalogued by the largest Jobbers.

E. G. MANUFACTURING CO., Inc.,
250 West 54th St., **NEW YORK**
Samples sent on request. All goods F. O. B. Meriden, Conn.

REPAIRMEN I HAVE MET

(Continued from page 41)

and a new Cadillac would work into the scheme of things; especially if he would be paid to drive it.

I suppose that the reader wonders how a car can be "joy driven" without showing additional mileage on the speedometer. But this is easy—take it from one who knows from experience a speedometer will not register if the fibre gears are disconnected, or if the shaft is disconnected at the head.

Our New York readers or those who read New York daily newspapers may have remarked upon the fact that in many automobile accidents in this city the newspaper reports—"records show that the automobile, which presumably caused the accident, is owned by Mr. so and so." And then if you follow up this peculiar report you will often find that "Mr. So and So left his car in a garage and did not know that it was being used at the time of the accident." Doubtless the evil of using a customer's car is one which exists in many garages throughout the country.

The Borrowing Habit

To my mind one of the worst evils existing in a public garage is the "borrowing" habit; I am speaking now in relation to parts, not tools. I have heard car owners actually boast that they had obtained new tubes or certain new repair parts with no cost to them. Let me tell how this particular game is worked.

A certain man, who is not particular as to his honesty, makes a habit of storing his car in a certain garage. Because he becomes a regular patron, the garage owner, if he is also unscrupulous, allows the patron many privileges. As a matter of fact the garage owner often becomes a party to the crime, if such the "borrowing" may be termed.

The man wishes to take a long trip and finds that one of his tubes is porous or perhaps so old that he is worried about it. So why worry, why not let someone else do the worrying? So he asks the garageman a few questions and finds that one of the owners of a car with the same sized tires will not be in for a few hours. He removes a tire from this car, substitutes his own tube for the one in the other tire, and thus makes a good trade. He cannot lose anything because his own tube is practically worthless.

Or perhaps he is not quite satisfied with the ignition head on his car. It is a matter of only a few minutes to make a desirable trade with some other innocent owner. And the other owner seldom knows the difference. Even if the innocent "tradee" finds that an exchange has been made he has no proof, and perforce must keep quiet.

Unfortunately I cannot take the space to describe all of the tricks practiced by some of the trade. It is said that there is a poor dupe born a minute and it is also true that new tricks and games must be invented every day to give the poor suckers variety to their entertainment. I have one more interesting case which deserves the careful

consideration of the reader. As yet the answer to the problem has not been given.

The problem presented in this story is, "To what extent is a service station liable on a new car guarantee?" The story is based upon true facts, only names being withheld.

A "Guaranteed Car"

Mr. Smith bought a new six cylinder "Belding" car, and this car was covered by the usual guarantee for six months. From the beginning the car did not give satisfaction, five of the cylinders were there but the sixth was missing most of the time. Mr. Smith took the matter up with the local service station where the purchase had been made and the mechanics fussed around for several weeks without satisfactory results. Finally the manager of the local station threw up his hands and suggested that the car be taken to the New York branch where there were ignition experts who could fix the car up.

The manager was in the habit of making such transfers of work because his own shop was not equipped fully and to take care of this exchange he issued orders to the New York department. Mr. Smith drove his five cylindered six to the New York service station and left it with the statement that the order would come through from his local station.

A week passed and Mr. Smith was called on the phone and told that his car was ready, so he called and was presented with a bill for \$125. Mr. Smith promptly fainted away and when he came to himself again he couldn't remember enough slang names to call them, or keep his chin going fast enough to say what he thought.

A Slight Error

It finally developed that the country service station had made a slight error in their order for repairs, instead of ordering, "Overhaul ignition system on car number 64397" they had omitted the words "ignition system" and the order read, "Overhaul car number 64397."

Mr. Smith naturally refused to pay the bill and just as naturally the New York service station refused to surrender the car. Finally, however the New York branch consented to send the car to the country branch and charge the bill to the latter. Mr. Smith was advised to take the matter up locally.

The car was driven but a short way from the New York station when it caught fire and was totally destroyed. Mr. Smith collected from the insurance company in due course and bought a new car. But, and here is the climax, the local service station has billed Mr. Smith for \$125 for repairs to his car which was destroyed, and refuses to make any adjustment, claiming that the work was done and that the fire did not relieve Smith from his responsibility. We understand that this matter will be brought before the court.

In our opinion the local service station cannot collect on this bill since the repairs were made without an order from Mr. Smith; but they can cause that gentleman considerable trouble.



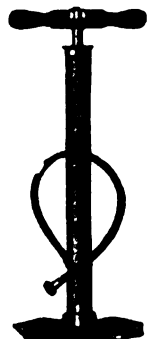
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EMIL GROSSMAN
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New York

The Biggest Values
Ever Offered the Automobile Accessory Trade

No. 6 Pump—Scientifically designed, 1 1/2" cylinder, 1/2" plunger rod, very sturdy and exceptionally well finished. Heavy malleable base Plates, Red Handle.



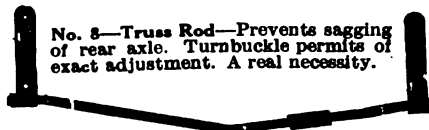
	List Price	Jobbers Price	Our Price
No. 6 Big Bear Pump	3.00	1.50	110.00 Per C

No. 7 Valves—Complete threaded valve with locking nuts. Permits of exact adjustment making motor quiet and adding power.



Write for our Price List showing unusual quotations on over one thousand additional standard automobile accessories.

	List Price	Jobbers Price	Our Price
No. 7 Adjustable Valve Stems for Ford...	.35	.15	10.00 Per C



No. 8—Truss Rod—Prevents sagging of rear axle. Turnbuckle permits of exact adjustment. A real necessity.

	List Price	Jobbers Price	Our Price
No. 8 Adjustable Rear Truss Rod ..	1.00	.45	30.00 Per C

Every article is a **leader** in its class and now more popular than at any time since they were placed on the market.

The prices named will be withdrawn after June 15th or as soon as our stock is depleted. We suggest prompt action.

E. G. MANUFACTURING CO., Inc.,
250 WEST 54th St., NEW YORK
Samples sent on request. All goods F. O. B. Meriden, Conn.



Make Your Top Look Like New In One Hour

With Johnson's Black-Lac you, yourself, can easily and quickly make your top and side curtains look like new. No experience required—all you need is a brush and an hour's time. It gives perfect satisfaction on any kind of a top—leather, imitation leather or mohair. One coat imparts a rich, black surface just like new.

JOHNSON'S BLACK-LAC

The Perfect Top Dressing

Johnson's Black-Lac is easy to apply—you can do it yourself—in less than an hour. It dries in fifteen minutes and will not rub off on the hands or clothing. It is permanent, waterproof and inexpensive. It acts as a preservative for the finest leather, making all kinds of top material soft and flexible.

Keep Your Car Young—Free Book Tells How

Write for our free book on Keeping Cars Young. Tells how to make your car look like new—remove carbon yourself—mend radiator leaks—lubricate springs—remove spots, tar and alkali—revarnish your car—grind valves and mend your own tubes.

Mention the name of your accessory dealer.

S. C. JOHNSON & SON
Racine Dept. AD-5 Wisconsin

Please mention the Automobile Dealer and Repairer when writing to advertisers

The lessons to be derived from this horrible example are, that every owner should obtain a signed estimate from his garageman when the latter is to make repairs; the owner should also see that he does not sign any order for repairs of a vague nature. And further, when he buys a new car he should insist upon a written guarantee signed by the manager of a service station rehearsing the original terms of the purchase in full.

And the lesson for the owner which I wish to put across is that the owner should familiarize himself with his car if he puts it into the tender hands of the garage mechanic. Once he finds an honest man, he should stick to him and not be led astray by cheap work of other mechanics.

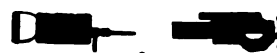
And the lesson for the garageman who reads this article is that honesty is the best policy in the long run. You cannot expect to fool all of your customers and once a few of your patrons find you out, your business is gone and gone for good.



Rules of the Road—Tokio

(Posted in Central Police Station)

- 1—At the rise of the hand of the policeman stop rapidly.
- 2—Do not pass him by or otherwise disrespect him.
- 3—When a passenger of the foot hove in sight tootle the horn; trumpet at him melodiously at first, but if he still obstacles your passage tootle him with vigor and express by word of the mouth the warning "Hi Hi."
- 4—Beware the wandering horse that he shall not take fright as you pass him by. Do not explode an exhaust box at him. Go soothingly by.
- 5—Give space to the festive dog that shall sport in the roadway.
- 6—Avoid entanglement of dog with your wheel spokes.
- 7—Go soothingly on the grease mud as there lurks the speed demons.
- 8—Press the brake of the foot as you roll round the corner to save collapse and tie up.—*Bus Lines.*



Papa's Mistake

Edith—Dickey, dear, your office is in State Street, isn't it?

Dickey—Yes, why?

Edith—That's what I told Papa. He made such a funny mistake about you yesterday. He said he'd been looking you up in Brad Street.—*Driver Dan.*

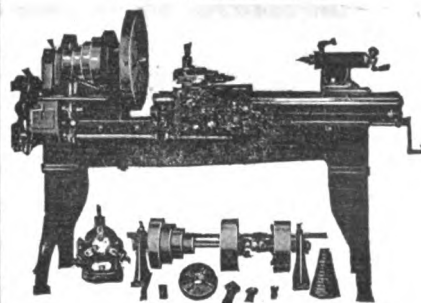


The advertisement that makes you want to buy the goods doesn't contain many words that you have to look up in the dictionary.

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Just the thing for Garages and Motor Repair Shops.

A high grade lathe with a wide range of usefulness at a very reasonable price.

The Universal is strong durable and accurate. It will cut right and left-hand threads, and millimeter threads. It is capable of perfect work on all kinds of milling jobs, taper work and cylinder re-boring.

No motor repair shop can afford to be without this high-grade, reasonable priced machine. Drop us a line and ask for new bulletin and latest prices.—It will start you on the road to bigger profits.

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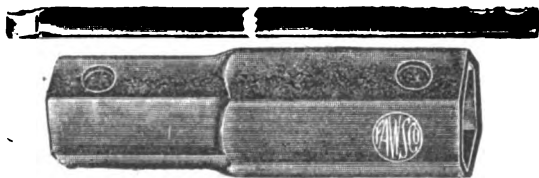
818 CHESTNUT ST.

ROCKFORD, ILLINOIS

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The openings are arranged for minimum clearances both inside and outside. Packed in individual boxes.

No.	Fits Plug Shell	Natural-oil finish, all sizes,	
29x31	$\frac{7}{8}$ x15/16 in.	Each, 35c	
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May 1 prices were reduced. Write for complete catalog.

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ARE BEST

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 16-22 Hudson Street - New York City

Entered as Second Class matter January 15, 1921, at the Post Office at Cooperstown, N. Y., under Act of March 3, 1897

Vol. 13, No. 4

JUNE, 1922

Monthly \$1.50 per
Single Copy 15c



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C. A. SHALER CO., 805 Fourth., 'St Waupun, 'Wis.



**The Nightmare of Every
Motor Owner**

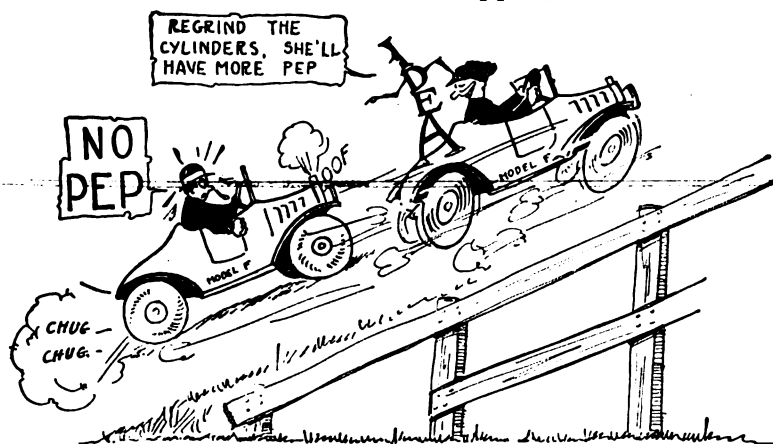
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It requires no great mathematician to figure out the business that is available for any machine shop, auto repair shop or garage that can cure the every-day motor troubles, such as lack of power, excessive use of gas and oil, sooty spark plugs, skipping, etc.



Lack of Power and Pep

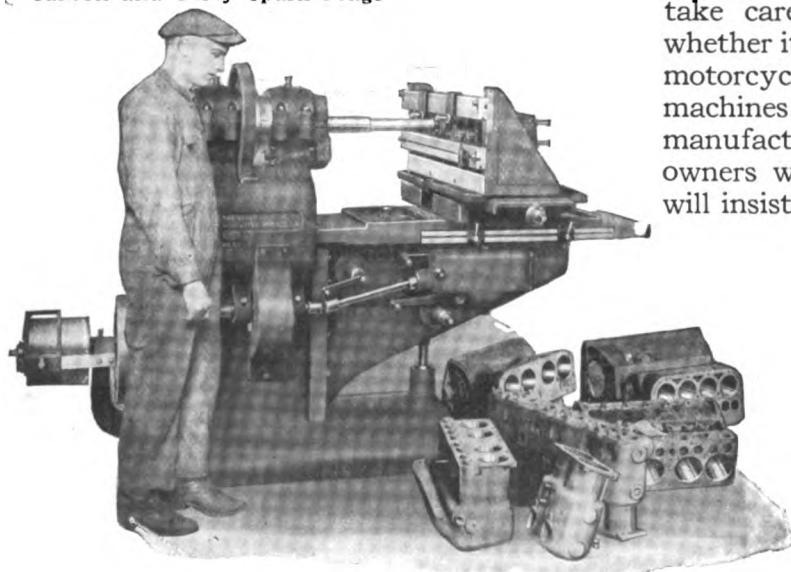
This IS being successfully done by HEALD owners in various parts of the country today by regrounding the cylinders and fitting new pistons and rings. In some localities it is well taken care of but there are still many central points where some live, up-to-date fellow can make good. This is particularly true at the present time, for the economy of reground cylinders appeals to the owner of both the low and high priced car.



Carbon and Dirty Spark Plugs

If you are running a shop, consider these facts and then see if there is anyone in your neighborhood who can take care of this work. If there is and you are not in a position to put in equipment, send your blocs to him and get your commission. If, however, you find no one with a HEALD machine in your trading center, it is a business opportunity you cannot pass up. Regrounding is high grade work, commands high prices, and right now is the high peak in the business.

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Automobile Dealer and Repairer

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The conclusion of a Journey during the reign of Tarvia the Black

Foreword

WITH the conclusion of this third chapter we say "good-bye" to the two characters, Hank and Grezi. The writer claims that he can no longer stand the strain of piloting 16th century characters upon a 20th century automobile trip. Our artist's imagination has failed him and both Hank and Grezi refuse to be interviewed. So with this final installment Hank and Grezi sink back into oblivion.

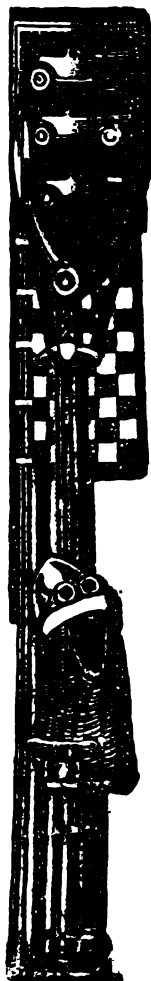
* * *

Chapter III

NOW it came to pass as they journeyed that they came to a boulevard of a fine and level surface so that Hank opined he might make sixty on it; and they both lifted up their voices in praise of Tarvia the king for that he had caused the same to be made; and many and various busses passed and repassed upon its surface.

And Hank said, "Whaddyer say if I let her out?" and Grezi agreed and said he wanted to know whether the old boat had four legs or only three. But when Hank essayed to show him and had presently attained some speed, they saw before them a young maiden of about seven summers; and upon her feet were wheels so that she glided whithersoever she would. As for the maiden, she gave no care to the multitude of busses, albeit many placed her in jeopardy, still did she as her mind bade her. Now upon seeing this Grezi shouted "WHOA" being carried in his mind to the days on the farm but Hank had foreseen and stopped albeit missing her by an exceeding small space.

And Hank spake between his gasps, saying, "M'dear, thou hast given me a fright, wist ye not that this place be full of danger to such as thou?" "Nay," answered the maiden, "for my mother saith that this is the king's highway and I, even though I be but young, have as much right here as thou who art older." "But I might have knocked thee for a goal," said Hank. "An ever thou didst," the maiden said, "my mother would hale thee into a court of law and thou



wouldst be made to pay her of thy wealth," and she glided on. So they turned themselves about and went even into the middle parts of the City, deeming themselves in greater safety there.

Now it came to pass that, when they had arrived to the marts wherein trading was done, they halted before a place where busses, both new and old were freely offered to the citizens of Athens in exchange for sequins;



The Young Man Beseemed Himself to be Pleased with the Buss

and when they had entered therein, a young man clad in fine raiment did accost them as they stood before a new and shiny buss; and the young man beseemed himself pleased with the buss and spake, saying "some boat" and he began to extol the merits of it and spake of the ignition thereof, also the engine, the cushions and the finish saying, "many busses have ye doubtless seen but, verily I say unto you, nothing to be compared with this; for it beginneth where all others leave off.

"It was designed by I. M. Smart who was formerly with them that made the Chandilier and it requireth little or no driving and goeth with great economy," and many other things said he in praise of it and spake of it sometimes as a "job" and at other times as a "wagon" and a "Creation" at such length that their mouths opened in wonder.

"Now how many parsangs will she make upon a measure of gas?" inquired Hank. And the young man answered him, saying, "A man was here yesterday who said he drove much among the hills, carrying many with him and he told me he made twenty."

"But he was a liar was he not?" quo Hank. "Verily I think he was," the young man made answer; "as for me, and I made twelve or mayhap thirteen, I deem myself worthy of much praise, but I told you what the man told me,"

and he turned him to another who was lately come in.

"Now what posseseth a man that he goeth about lying about his buss," said Grezi, "for I and thou also have hearkened to many such, and most of them were honest for the main, and until they talked of gas or tires or speed or something belike, were to be believed."

"It passeth my comprehension," answered Hank; "I do truly know them of which you speak; for I know an

one who hath a family and the respect of his neighbors, and he told me of a tire on which he had ridden 10,000 parsangs and yet again, in but a few days he said of the same that it was 8,000 and to others, yet a different amount, until men spake of him with tongue in cheek and with much laughter and yet another who spake of the speed at which he went, yet, when he was brought before the magistrate for much speeding, he did swear upon his oath that his buss could not compass such speed." And they passed out from that place.

Soon passed they another mart before which a great concourse of the people had gathered; and they tarried, wondering what had occasioned it; and when they had rubbered, behold! It was yet another buss of a new make and yet another young man came to them inquiring if, perchance they had acquaintance with it. And when he learned that it was strange to them, he besought them to ride, saying it would cost them nothing.

Now it came to pass that, when they were seated the young man started a stream of bull in all manner like unto that of him at the other mart, so that Grezi opined that they must be brothers, for every doir of praise bestowed upon the first buss was likewise bestowed upon this; and Grezi told him of the other buss and the young man said he was working for that house only last week, but left because this buss was the coming job. And he gave her the gas and bade them see at what a speed she would travel; but Hank answered him saying,

"Nay, good friend, speed concerneth me not; for I know of no make of buss that will not go as fast as any prudent man should drive; but show me how SLOW she will go without bucking; then shall I know if she hath power enow to cope with mud and sand and hills upon the highway." "But I would show thee how she will hold the road," the young man said. "Nay, it is the driver should hold the road," Hank made answer, "and I want no man to wonder in his mind whether I belong in the booby-house or no, as I have done aforetime as to speed-hounds I have met."

Then the young man said she would jump a stone wall and, perchance, climb a tree at need and without damage; but Hank said he had no use for these things since Volstead was elected and was content with a fair and smooth highway; whereupon the young man turned him about and said he had another demonstration to make. Now when they were again in their own buss, Grezi inquired what he had meant by demonstration and Hank, answering him, said, "it cometh from the word *demon* and when thou knowest the meaning of that word, thou also knoweth how it is used by some of these young men." "He spake nothing as to the price," said Grezi; "and I was not concerned to know," answered Hank, "for, if I mistake me not, that boat will be an orphan and in a short time, peradventure I needed a new part, it could not be had; for there is still great confusion as to sizes



and threads among such folk, so that one should be compelled to buy only of the maker, and standardization is not yet fully accomplished."

Now it came to pass as they rolled along, that Grezi spake saying, "when do we eat?" for I have a feeling of want within me, which methinks a plate of beans would go far toward allaying," and Hank made no reply, but proceeded to a spot at which was a sign NO PARKING HERE and drew up beside the walk; and they gazed and saw a sign which told them that eats might be had there; and they ventured within. And an handmaiden approached them after a goodly time of waiting inquiring their pleasure; and Hank said, "fair wench, might one obtain here a steak of such and such description?" and the maiden answered, "yea."

And Hank charged her straightly that it be of a particular cut and cooked after the manner which he ordered; "and tell thy father, the inn-keeper, that I am fussy as to my steaks and that I must have them just as I have said," but the maiden said, "Lo, I am not a daughter, but only a waiter," but Grezi held that they were the waiters and had already waited a long time. Upon this, the maiden went to a window and called thereat; and Hank, looking at Grezi, asked him what she said; "one steak," quo Grezi, But, in fullness of time their meal was before them, with many plates but small store of food withall, but they were perforce content. But when they came forth they spied one who sold fruit and did buy of him and ate until their hunger was satisfied.

Now when they drew nigh unto the place where the buss was left, they spied a young man entering therein; and his manner was that of one who owned it; and he started the buss, but when he would leave, the gear-shift was locked; but he drew forth a goodly number of keys and essayed to use them, one after another; but Hank made outcry and demanded by what right he did this and the young man answering, said "this is the buss of my uncle and he charged me straightway that I drive it home for him." "Did he leave it locked?" asked Hank. "verily," quo the young man, "such is his habit." But Grezi, seeing a cop in the distance asked him to wait until more might be known but the young man said he must have made an error and should have gone to the next block and straightway departed.

"Now let us depart," said Hank, "or ever we are robbed of all we have; for I am fed up with this wicked and perverse people and find it no place for one like me," and they made haste to go.

Now, when they had reached the open road, Grezi desired that he might try driving, albeit he said he had not driven since he had the grippe; but, when they had changed places, Grezi was timid and he fumbled the shift for some time and, in the end he started to back her; but Hank corrected him and after much trying he essayed to go forward; but after they had crawled in low for a space, he dare not change and Hank had much ado to

instruct him; and it came to pass that others, as they passed, smiled and Grezi was covered with perspiration and he evermore wobbled until drivers reproached him, desiring that he mind his step; and one averred that he



"Fair wench, might one obtain here a Steak?"

squeezed the varnish from out the steering wheel and others said unkind things.

And Grezi raged, but Hank besought him not to give up; but after a little time, he forbore and Grezi besought him that he tell him how to stop for he was full of fright. And when they were again in their accustomed places Grezi said he had no business to attempt to drive, as the doctor had told him he could not do so; but Hank, smiling, made answer, "and have ye paid a leeches fee to be told that? friend Grezi, verily, I could have told ye the same and it would have cost thee never a penny."

But Grezi was downcast and muttered to himself; and Hank, willing that his black humor should pass, said, "noted ye friend Grezi, when we were in Athens, the number of those who went about the streets muttering? As for me, I saw them on every hand—men hurrying from place to place with their lips moving like unto one who hath been told to get a spool of thread and needles, and eke to telephone aunt Maria and not to forget to send home the dinner and divers others messages and is afraid he will forget and be brought to shame when he returneth homeward?"

"Aye," answered Grezi, "I verily did see that of which ye speak and I have read of late the words of one skilled in such things, who maintaineth that it is a disease of cities and that we of smaller places are not in danger therefrom." "The Gods be praised," said Hank, "for they remind me of the Jabberwock and I have no desire to be of their number."

So they fared on for some distance and they espied one standing by the wayside who beckoned and when they had stopped he said, "give us a lift." But Hank shook his head and passed on. And Grezi marvelled thereat and asked Hank why he refused the wayfaring man and Hank answering, said, "marvel not, Grezi, that I passed that guy—for I knew him not. Men have, ere now, been done to death by those whom they have picked up on the highway; others have unwittingly aided in the escape of criminals who were being pursued by the



police; them that have made their lucky escape from prison or from the booby-house have likewise been transported in secret by drivers who were good-fellers, who, thinking to do a favor have hindered the course of justice; mind ye not what I said in the matter of them that drove truck both night and day? verily, as for me, I take in no one of whom I know not, lest peradventure I also be guilty of like foolishness; I do certainly believe that a law will yet be made that will prevent the giving of rides to those who are not known by the driver."

After a space, Hank essayed to peer into the distance along the highway on which they travelled and eftsoons he spake unto Grezi, saying, "but a short time since there was a small bus, even a flivva before us, but now I see it not." "It turned into a cart-path a while back," Grezi made answer.

"Now why spoofest thou, Grezi," said Hank, "verily many things may be done by a flivva, but never yet hath one turned into any such thing; it is well known that tadpoles turn into frogs and I have heard that witches turn into black cats but as for a flivva turning into a cart-path, surely no man would believe thee?" But Grezi insisted that it was even as he had said.

In this manner they beguiled the time until they began to view scenes which were familiar to them of Rome again. But Hank drew up beside a booth on which was an inscription telling them that SWEET CIDER was there to be had; and when they had each drunk a measure, they inquired the cost of sundry flasks of the same that were there in view; and Hank was of a mind to buy, but Grezi spake, saying, "have ye none that is hard? for methinks that which we drank had an exceeding flat taste, albeit it was sweet as ye represent." But the woman averred that they had none but fresh. "Now how soon will this that ye have be hard?" asked Hank.

"Good sirs," the woman made answer, "I am strictly charged by my good-man not to give that information, lest we fall into the hands of the cops, for it is not lawful in this land, since the days of Volstead, his act, that man shall know of any refreshment having more than one half of one percentum of strength therein—but this I may say without fear; there came yestreen one who desired to purchase two barrels; and I marvelled that he needed so great a quantity, but he said that the nobles, even the mayor and other of our rulers were to give a feast and when I asked him the day of the feast, he told me it was next month and I now think him to be a man of judgment and discretion." So Hank bought a goodly flask of her and they wended their way.

"Now, what think ye of this here Volstead?" quo Grezi. "I have heard that Satanus was the father of

lies, but it seemeth to me that Volstead runneth him a close second, for we hear of them that were aforetime good men and true, evading and breaking the laws and lies and deceit are become common among us." "Thou speaketh sooth," Hank made answer, "and I do know of them who never drank until after the days of Volstead and who are not yet accustomed to it, but continue to drink, as it were by way of protest. The drys have bitten off more than can be chewed; it is in my mind that, had we first been denied strong waters, and the public bars been suppressed (for certes, they were a reproach to us) then in fullness of time, more might be done in this line and with knowledge of the will of the people withall; it becometh me that the drys well know that they secured too strong a ruling as to that which will intoxicate, but they dare not give up that which they have, for fear that the whole be lost." "Yea," answered Grezi, "a woman cannot brew her own yeast and be within the law, and a law is of no avail unless the people agree therewith."

"By this time they had left the highway of King Tarvia and had entered upon that maintained by the moss-backs; and Grezi besought Hank that he drive circumspectly and with much care, saying, "wist ye not what we endured as we came this way?" and Hank remembered; but, in the place of ruts as aforetime, they found sods and stones of the size of a clenched hand and greater in the road's middle parts also, much loose earth so that they had much ado to wallow through. "Now what have they done now to the road?" said Grezi. "They have been laying of it up," answered Hank, "and now it must be like this until we and others wear it down to ruts and bumps again, unless perchance a rain cometh and washeth it all back again or ever we wear it hard"; but he put her in second and at length won to a part that had not yet been improved and so, to their home.

And Grezi climbed out with much creaking and was unsteady upon his feet with stiffness, but he declared he had much pleasure in the journey. And Hank told him that he considered taking the buss down and cleaning and grinding her and inquired of Grezi if he would fain be of help to him in so doing and Grezi made answer, "right willing will I be when I have rested, for I much admire and enjoy thy language when thou turnest thyself loose, friend Hank, if, perchance, a bolt or nut be lost or be found to have been left within the transmission or yet thou gettest mud or oil in thine eye; and, moreover, I do love to see thee trying to kid thyself into thinking a valve is ground enow when thou knowest in thine heart it is not, but only thou art weary with much grinding." And they gave each other good day.



That High Temperature

**During Hot Weather the Automobile Engine Tends
To Overheat if Conditions are Not Ideal**

By F. L. Almy



BEGINNING with the first warm day of Spring the temperature of many automobile cooling systems starts to grow with the flowers. The average motorist touring on a hot Summer's day will encounter many other less fortunate motorists, stopped by the roadside waiting for their engines to cool.

To give any receipt which will prevent engine overheating is as difficult a matter as to figure out in advance which way a hen will jump when confronted with a noisesome Flivver. However the cooling system is so simple that it can be put into condition in every way in a short time and it does not pay to spend time "doctoring up" a few parts.

Before we tell our readers how to cure their engines of overheating it might be well to consider two units of the engine. Put the engine itself into mechanical condition and, in many cases, it will not overheat. It seems hardly necessary in this article to warn the reader that the oiling system must be functioning properly and that the radiator must be kept filled with water, but there are a few drivers who neglect these points.

Valve Timing Must Be Correct

The valve timing must be correct and the valve clearances carefully adjusted. It is vitally important that the exhaust valves remain open long enough to allow the burned gases to escape. Set the valves so that the exhaust valves open after the top center of the exhaust stroke has been passed. Set the valve clearances so that the valves will open their maximum.

The second point to consider about the engine is the carburetor adjustment. Set the carburetor for the economical condition, allowing as little fuel to enter as will support combustion. Take off the hot air stove in the warm weather.

And having adjusted the valves and the carburetor we can consider the cooling system itself. There are two types of systems in general use, thermo-syphon and water pump. Of these two, the writer is of the opinion that with the same capacity of cooling system the water pump system will operate at a much lower temperature than the thermo-syphon.

The Hudson car, for instance, with its large and powerful engine carries less water than the average small car with a thermo-syphon system and yet the Hudson is famed for its low running temperature.

This fact would indicate that there is hope for every owner of a car which overheats for he need but put

a pump in the system and other things favorable the temperature is immediately lowered.

To work at all, the thermo-syphon system must be kept full of water. Just as soon as the water level falls below the upper outlet to the radiator the water will cease to circulate and begin to overheat. The thermo-syphon system depends entirely upon the fact that hot water tends to rise. In the gasoline engine with a thermo-syphon system the water in the engine jackets heat and rises to the top where it runs over into the radiator. As soon as it reaches the radiator it cools and drops to the bottom from whence it runs into the engine again.

One can readily see that there is no pumping action, merely a circulation and that the water must boil before it will run over into the radiator if the system is not filled above the upper outlet.

With the pump system, however, the situation is entirely different. As long as there is water in the radiator to the height of the pump it will be sucked into the pump from below and forced through the water jackets back to the top of the radiator.

With the thermo-syphon system the temperature in the jackets must rise to about 180 degrees or over before the water circulates. It might be possible to freeze the water in the radiator and yet it would not circulate until the engine temperature were high enough to cause the thermo-syphon action. If the water jacket and radiator passages were small and the action were restricted then the water could not circulate fast enough to keep from boiling.

Contrasts of Temperature

Boiling water at the top of a radiator and cold water at the bottom is no uncommon occurrence with a thermo-syphon system. On the other hand with the pump system such a condition could not exist because the pump will circulate the water regardless of temperature.

With the exception of the pump and perhaps a difference in the sizes of the connections, the thermo-syphon and pump systems of cooling are the same and in general so that what is said of one is true of the other.

The first important point to remember is that all water passages must be clean. To clean a cooling system correctly is a big job but in the end the work is fully justified.

First remove the radiator from the car and take off the cylinder head. This will enable you to get at the water jacket spaces and scrape them with a carbon scraper or a sharp wire. Get out all of the caked-up lime and rust scales that you can reach. Any kind of scale, either from lime or rust will cut down the absorption effect of the water and the engine will overheat.

Having scraped the water jackets in both the cylinder and the head, replace the latter and turn the hose into the upper water connection. If there is a water pump on the engine remove it so that the water will run through the jackets freely and flush out all of the loose scale.

The radiator, inside, cannot be scraped without a big chance of damaging it but you can clean the air spaces. A radiator simply brings the water into indirect contact with the air and the heat from the water must pass to the metal in the radiator and then be absorbed by the air. If the air passages are obstructed or the metal is not clean, then the water will retain the heat.

Effects of Night Driving

It does not take much to obstruct the air passages in a good honeycomb radiator. If you make a habit of night driving through the country you will find that after a few hundred miles the honeycomb is so filled with bodies of dead insects that but little air can find its way through. A stream of water through the radiator will remove the insects but will not remove the oil and dirt.

Put the radiator on its face and soak it well with soap suds to soften and dissolve the oil, then force a stream of water through it. Examine it to see that the paint is not blistered on the fins or the honeycomb. A layer of thin enamel which has blistered away from the metal is a good heat insulator and is often the reason why a radiator does not really radiate.

The radiator is then put back on the car, using the old water hose for the connections. Then fill the cooling system with a strong solution of washing soda and water. The proportions are $\frac{1}{2}$ pound of soda to five gallons of water. The washing soda should be mixed with the water and strained through a cloth before it is put into the radiator.

Then run the engine for about ten minutes and let the solution stand for the same length of time. Run the engine again to stir up the solution and then take off the lower water hose. Turn a stream of water directly into the top of the radiator for it is vitally important that all of the washing soda solution be thoroughly removed. There is not much danger of damaging the engine by leaving the solution in it but there is a chance that the soda will cause electrolysis in the radiator and cause leaks.

Replace Water Hose Frequently

After all of the soda has been flushed out replace the water hose connections with new ones. It is an excellent plan to replace the hose connections once each season.

The fan is of almost as much importance as the radiator and unless it works properly it will obstruct the passage of the air instead of helping it.

Remove the fan belt and give it a bath in soap and water. Rub the soap suds into the belt with a stiff brush and when the belt is clean and dry give it a treatment in neats foot oil which will keep it pliable and yet not cause it to slip. This statement applies only to leather belts. The fabric belts may be washed in soap and water but will not need the coating of neats foot oil, though this treatment will not damage them.

Since many leather belts are joined with water soluble glue, you must be careful when washing them. Use cold water and rub them with the brush but do not soak them in water. Dry them immediately and should the glue be dissolved it is not a difficult matter to re-glue them again.

If the washing does not clean the belt then it may be turned inside out and will then give considerable service. In putting the belt back again be sure to have it fairly tight, so tight that the fan cannot be spun but can be turned with a little pressure.

Automobile water pumps are of the rotating type, or as they are often termed "centrifugal pumps." The rotating part is called the impellor and are nothing but a set of flat arms which throw the water from the center to the outside by centrifugal force. The flat, straight blade type cannot be assembled incorrectly but the type which has an S type blade can be assembled so as to stop circulation.

If your pump is of the S blade type then you must be careful in putting it together or it will be worse than nothing at all. When the blade is in place and you are looking at it in such a way that the S shape is correct, it must run counter-clockwise. In other words if the blade is properly put on it will rotate away from the ends of the curve.

To sum up we might say that; (1) Clean radiator and engine inside with chemical and scrape inside of engine jackets; (2) Clean outside of radiator; (3) Clean or install new fan belt; (4)

General Summary of Facts

In order that the reader may have a condensed memorandum of all the causes for overheating and their remedy as well as a condensed chart for repairs to system we submit the following list.

- (1) See that oil system is functioning properly and that there is oil in the system.
- (2) Remove all carbon from engine and valve ports.
- (3) Time valves properly and see that valve clearances are correct.
- (4) Take off the hot air stove in warm weather.
- (5) See that ignition is timed correctly and not retarded.
- (6) See that radiator is clean inside and out.
- (7) Clean the water jackets.
- (8) See that fan belt does not slip.
- (9) Keep front of radiator clear of all obstructions.
- (10) Operate on as lean a mixture as possible.

TRAGEDY RECIPE

Take one reckless, natural born fool. Two or three drinks of bad liquor. A fast, high-powered motor car.

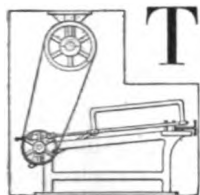
Soak the fool well in the liquor, place in the car and let him go. After due time, remove the wreckage, place in black satin-lined box and garnish with flowers.

—*Pure Oil News.*

The Re-Surfacing of Cylinders

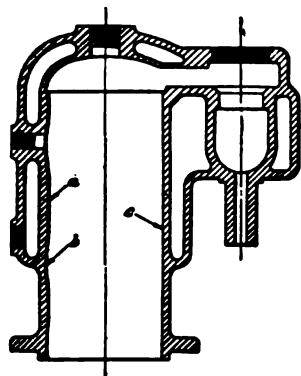
The Subject of Re-Grinding Is One Which
Should Be Understood By All Our Readers

By F. R. Phillips



THE pot of gold at the end of the rainbow, though a pretty fancy, is one which has captured the minds of many people. Everywhere we see wise men chasing rainbows and trying to find the pot of gold at the end; gamblers in Wall Street; buyers of Oil Stocks; Race Track chasers and so on without number. Some of them find the pot of gold, but this merely happens because Lady Luck has led them to the right rainbow.

In our own automobile field there are a number of real rainbows beneath which the wise man can find, not one pot of gold, but several and if one is clever enough to chase the right rainbow, toward its proper end he can reap a fortune.



Cylinders Do Not Wear Round or Smooth,
But in Hills as at A; in Valleys as at B;
and Long Bends as at C

One of the brightest rainbows in the automobile sky at the present time and which dips into a fortune at each end is that of "cylinder refinishing" and it is concerning this subject that we will speak in this article. Read carefully for it may well mean gold in your pocket.

There are, in use today in this country, 10,663,413 motor vehicles and probably enough steam, stationary and marine gasoline engines to bring the total number to well over the eleven million mark. Does not this figure give a thrill of contentment to the repair man when he stops to realize that practically every one of these eleven million engines will require cylinder repairs during the next two years?

The gasoline engine of to-day is operating under one great handicap, that of coarse fuel. Present day gasoline is of such a quality that it contains many elements which cannot be carbureted in modern vaporizers and consequently it enters the cylinders in a raw, liquid state. This liquid fuel with its high affinity for lubricating oils tends to destroy the lubricant and cause the rings, pistons and cylinders to be destroyed very rapidly. Once a cylinder has been worn out of round, in ridges,

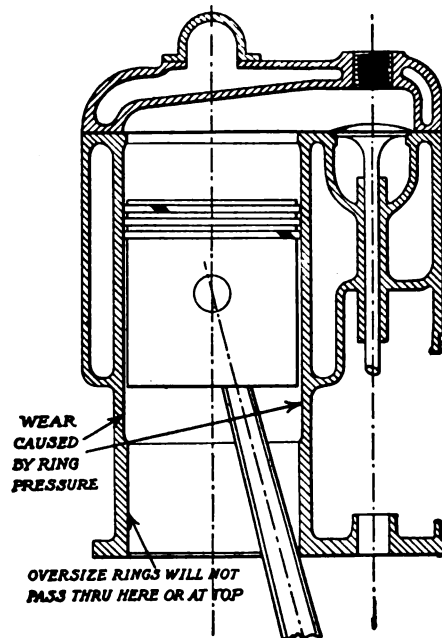
or scored by carbon particles the engine loses its efficiency and fails to give satisfaction.

Obviously it is not practical nor economical to operate an engine which gives only a small percentage of its rated power and consumes twice as much fuel and oil as it should normally. It is just as uneconomical to replace the cylinder blocks every 5000 miles. There is but one answer to the problem, re-finish the cylinders.

The garageman who chooses to install a cylinder re-grinding outfit cannot but make money if he lets the public know what he can do. It is not exaggerating facts to state that an old cylinder can be repaired by re-grinding to such a nicety that it is as good, and in many cases better than new.

We might state, with little fear of contradiction that an old engine properly re-ground and fitted with new rings and pistons is better than when new, even though it were originally ground and the rings properly fitted. This may seem to be a broad statement but we feel that it can be supported very fully.

A cast iron engine block, when first made, is subject to many strains and though the manufacturers are very careful in heat-treating the cylinder castings, it is obvious that all of the strains cannot be removed. Only



Normal Wear Reduces the Cylinder Diameter over the Part Traversed by the Rings So That Oversize Rings Cannot Be Installed with any Degree of Satisfaction

by ageing the casting can some of the strains be worked out and only by actual usage can many of the others be eliminated.

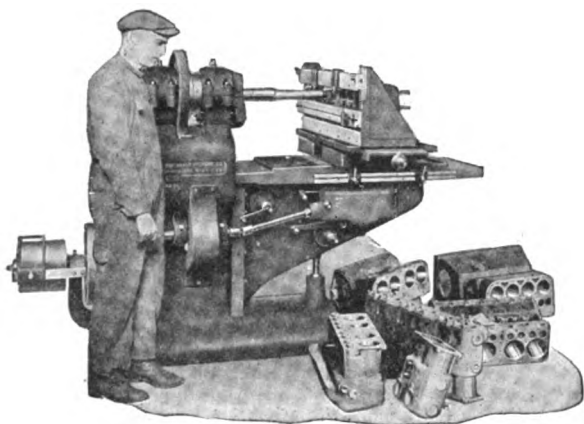
After an engine has been in actual operation for a fairly long period the cylinders gradually work free of

internal strains. As the iron molecules assume their final position the surface of the cylinders changes and usually the original surface is slightly different from the aged surface.

When the new engine is first built the cylinders are finished to conform with certain requirements and the rings and pistons are installed to fit the cylinders. But just as soon as the engine is operated under its own power, the extreme heat of combustion relieves some of the strains and the cylinder changes in contour. If the change is great, then there is oil and fuel leakage and consequent dissatisfaction.

Approximately 90 per cent of the new engines are finished by the grinding method and it must be admitted that this method has its advantages. It might well be said that a cylinder re-grinding machine is an asset to any automobile repair or machine shop.

A cylinder will not wear evenly for many reasons



On a Heald Machine of This Type an Average Operator Can Re-Grind from 16 to 20 Holes in an Eight Hour Day

and though the quality of the iron may prevent it from wearing in spots, the ring pressure is not the same over its entire surface.

If you will examine a leather sole on a shoe in which nails have been used you will find that the leather has worn down much faster than the nail heads. Exactly the same thing applies to hard spots in a gasoline engine cylinder wall and were it possible to take a microscopic picture of the whole of a worn cylinder wall, one would find that it is far from even.

Then comes the question of piston ring pressure. The average ring presses against the wall in spots and naturally this pressure eventually produces valleys in the contour of the cylinder. The rings do not travel the full length of the cylinder, so that the top edge for about one-fourth of an inch of the cylinder is not worn. There is also an unworn edge at the bottom of the cylinder and the cylinder will taper slightly outward at the bottom for a short distance, run fairly straight for about three fourths of the piston stroke and then taper in again.

Under these conditions it would be impossible to fit new rings to worn cylinders because a properly fitted ring could not be entered either at the top or bottom of the cylinder. If the ring were fitted to either the top

or bottom of the cylinder it would not be large enough to fit the cylinder properly.

There is still another item which makes for uneven cylinder wear. The natural swing of the connecting rod and friction upon the wrist pin, tips the piston from one side to the other and in time the cylinder will be worn oval.

From these facts one may see that the fitting of new rings to a worn cylinder is impractical. If the cylinder is worn, then it must be refinished and there is no alternative.

Various Methods Possible

In considering the various methods of refinishing a cylinder one must realize the difficulty of the work and since we have not the space in this article to consider more than one method of refinishing we will take up the question of re-grinding, only.

By the courtesy of the Heald Machine Co. of Worcester, Mass., we have been supplied with the illustrations which accompany this article. The writer has made a visit to a local shop where a number of Heald regrinding machines are in use and his observations are based entirely upon his own knowledge.

The two main points to consider in refinishing a cylinder are, first the thickness of the wall and second the quality of the iron. If these two things were constants, cylinder refinishing would be no particular problem, but unfortunately they are not.

In coring the casting it is virtually impossible to set the water jacket core absolutely true in relation to the cylinder core. Consequently the wall between the cylinder and the jacket is very apt to be thin in spots.

Although it is possible to obtain a fine grade of cast iron under certain conditions there is a great chance that moisture in the mould and uneven sand temperatures will cool the iron in spots faster than others. The metal too is often uneven and this leads to peculiar results in that parts of the cylinder wall will be hard, others soft.

In machining the cylinder, then, the difficulty will come in cutting off a perfect chip from an imperfect metal which may tend to spring away from the cutter in places and remain rigid in others.

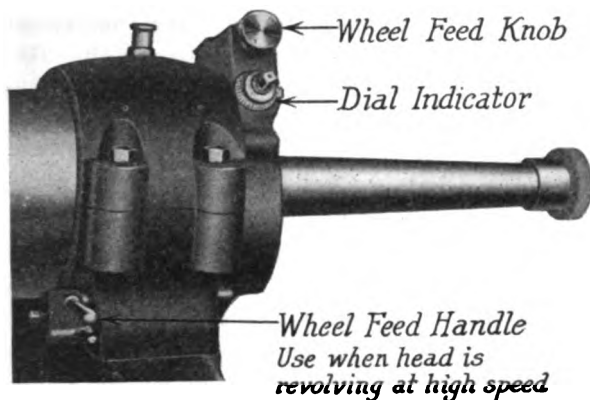
Chances for Error

The variance of the hardness tends to destroy the cutting edge of a tool and unless great ingenuity is used there is a chance for cutting a cylinder larger at one end, where the tool is started, than at the other where the tool finishes.

After considering all of these facts, the writer feels that he can safely say that the re-grinding method of cylinder refinishing is as near the ideal as can be expected.

The Heald machine, which we investigated, is well worthy of a full description because, in the writer's opinion, it is simple to operate, its operation is theoretically correct, and it is so fully automatic that the human element is eliminated as far as is practicable.

In re-grinding the cylinder the first point to observe is correct alignment in all three directions. The bore must be at right angles with the main bearings; the bore must parallel with the main bearing line; and the bores



The Heald Grinding Head Is Provided with Micrometer Adjustments for Controlling the Size of Holes

of the four or six cylinders must all be in line with each other.

In setting up the work on the Heald machine a special universal, quick locating, jig is provided. This jig is mounted upon the cross bed and consists of a pair of angle blocks connected by two heavy steel bars. The jig is fitted with great accuracy to the machine and in setting up the work it is an easy matter to apply angular and parallel tests.

Once the block is mounted upon the jig the table is moved either upward or downward until the grinding wheel will make proper the contact with the cylinder wall. A graduated scale at each end of the jig insures alignment with the center of the main bearings.

Cylinder blocks as wide as 38 inches can be mounted on the jig and the machine has a crosswise adjustment of 24 inches, which naturally is the limit for the center-to-center of the bores. This limit is amply large enough to take care of any automobile engine block now on the market.

There is practically no limit as to the size of bore which may be ground so that the repair man is in a position to accept any kind of cylinder work for steam or stationary engines as well as for motor cycles. The only limiting feature is the distance between the grinding wheel and the bed. Of the Heald machine this distance is seven inches minimum and nine and one-half inches maximum, measurement being taken between the center of the grinding circle and the top of the bed.

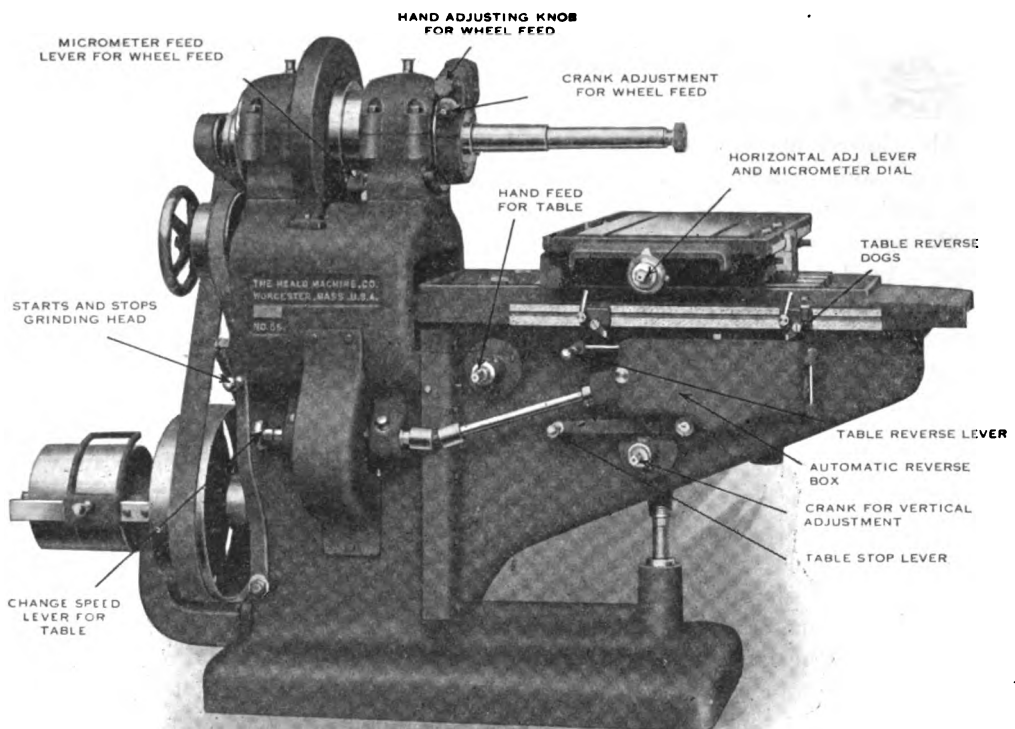
Within reason the size of the hole to be reground is governed by the size of the grinding wheel and from the above figures one can see that a difference of two and one-half inches in bore can be taken care of with one grinding wheel.

The main table is designed to travel, automatically, backward and forward on a line parallel with the grinding spindle and with a full assortment of grinding wheel spindles will take care of cylinders from zero to 23 inches in length.

A special automatic stop arrangement reverses the travel of the main table at any point desired.

The Planetary Action

The main casting or head of the machine is unique because of its peculiar action. For the purposes desired it is necessary to impart two widely different motions to the wheel. The grinding wheel must revolve at an ex-



The Heald Style No. 55 Cylinder Grinder Is So Fully Automatic that the Human Element Is As Nearly Eliminated As Possible

tremely high rate of speed and, at the same time, its center must rotate on a circular orbit. The whole proposition being comparable with the solar system; our earth revolves once every 24 hours and rotates around the sun once each year.

The revolving action of the wheel is easily governed by the size of the belt driven pulley and this pulley is fastened upon the grinding spindle. The spindle is mounted upon a large eccentric which, in turn is mounted in a second sleeve. A micrometer adjustment, as well as a coarse adjustment is provided for increasing or decreasing the orbit in which the grinding wheel travels.

In operation the machine is extremely interesting from a mechanical viewpoint. The grinding wheel rotates at high speed and is carried around the inside of the cylinder in a perfect circle. So long as the bearings are kept in condition the grinding wheel will surely grind a circular hole.

At the same time as the wheel revolves and rotates, the cylinder block is fed backward and forward. Thus the wheel takes off a thin skim of metal the full length of the

cylinder regardless of whether or not the grinding material is worn off. Under such conditions the cylinder must be the same size of diameter, and perfectly round its full length.

As soon as the high spots are ground from the cylinder the eccentric is adjusted to provide for a larger orbit and the wheel cuts deeper into the cylinder walls. With the various speeds and adjustments it is possible to take off as much or as little metal as required and at any speed within reason.

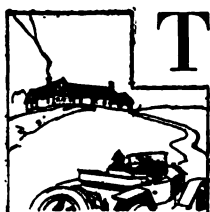
Being a grinding wheel proposition it is possible to remove only enough metal from a cylinder to bring the cylinder into shape. For the same reason, as every reader knows, it is an easy matter to gain accuracy despite hard or chilled spots in the cylinder.

All things considered, the grinding method of refinishing cylinders deserves investigation on the part of our readers. Machinery of this kind, we understand, can easily be obtained without a large initial cash investment and the returns are sure to be satisfactory if the owner of the machine uses proper publicity methods.

The Lowly Spark Plug

Rapid and Efficient Engine Operation Is
Dependent Upon the Strength of the Spark

By R. K. Helphenstine, Jr.



THAT highly essential product of modern technical skill, the spark plug, occupies a position in the automobile industry far out of proportion to its diminutive size. Were all of them suddenly banished from the face of the earth, however, the wheels of industry would be considerably slowed up, and our new transit power, the motor car, would come to an abrupt and prolonged halt.

The spark plug is to the internal combustion engine what the percussion cap is to the cartridge; each supplies the spark needed to cause the explosion. Through no fault of its own the spark plug is that part of the ignition system that is apt to give the most trouble.

Spark plugs are made in a multiplicity of sizes and shapes, but the principle in all of them is the same in that a central rod or electrode runs lengthwise through the center of the plug and is insulated from the metal tubular casing. The lower end of this rod forms one of the points of the plug, while the other end is threaded to receive the thumb nut.

The majority of spark plug manufacturers use porcelain as an insulating material. Some employ mica. In the construction of the latter type of plug the central electrode is usually wrapped with a sheet of mica and over this, washers of the same material are slipped one upon the other. The whole is then clamped in place and turned to shape. Other insulating materials in use are lava and glass.

The consensus of opinion of authorities on the subject is that the porcelain insulator is the most satisfactory. Those of lava and mica are liable to become oil soaked and thus permit the high tension current to short through the body of the plug instead of jumping the air gap.

Plate A shows the construction of typical spark plugs to be found on the market today. The forms shown in Figures 1 and 2 are the types most commonly used. Simplicity of design are characteristic of both, although No. 1 is a take-apart plug while No. 2 is not. Both are easy to keep clean, and are in marked contrast to that shown in Figure 3, where cleaning is made difficult because of the fact that the points are rather inaccessible.

The central electrode of the plug shown in Figure 4 terminates in a fine wire, the principal claim of merit in this type of construction being that the fine wire is not so apt to become short circuited since carbon accumulation is burned away as rapidly as it forms. Figure 5 shows a plug which is equipped with a priming device, and is intended for use in engines that lack pet cocks or priming cups. The priming device consists of a small groove at the top of the plug or a cup on the side and either a needly or ball check valve. By filling the groove or cup and opening the valve, raw gas is allowed to run into the interior of the plug and makes starting easy, especially in cold weather. Figure 6 consists of a plug with an inverted insulator, which is supposed to provide increased resistance against compression leaks should any part of the plug assembly become loose.

In addition the central electrode terminates in a knife blade firing point, the shell of the plug itself constituting the other point.

Some of the very latest spark plugs embody spark intensifiers, which are contained in either air tight or vacuum chambers molded within the insulator of the plug. These intensifiers are nothing more than auxiliary spark gaps, and are intended to further step up the ignition current and thus increase the spark. Manufacturers of certain makes of this type of plug claim that with the spark thus intensified every charge of gas as well as any oil that may get past the pistons is completely burned, thus not only eliminating the formation of carbon, but also providing increased power and added mileage. Two of these plugs are shown in Plate B.

Spark Troubles Easy to Find

Since spark plugs permit of ready inspection, such troubles as may occur in them are not at all difficult to locate. When an engine is irregular in its action or misses fire, and the trouble has been traced to the spark plugs, it is necessary of course to find out which plug is at fault.

The universal test for this is to short circuit each plug separately while the engine is running by holding a wood-handled screw driver in contact with the spark plug terminal and some part of the cylinder block. If the plug being tested is in good condition the engine will slow up perceptibly when the contact is made, while if the plug is defective no change whatever will be noticed in its operation.

The common cause of a spark plug failing to function

insulators, especially if the crack is low down in the body of the plug. Frequently a plug that is giving trouble may appear to be in perfect condition, but upon taking it apart for examination a very minute crack will often be found in the porcelain. Mica and lava insulators when oil soaked will give trouble in the same way.

Improperly spaced points often are another source of spark plug troubles. Where the points are too close together short circuiting will quickly result and the action of the engine will become very irregular, since the spark becomes too weak to properly ignite the charge in the cylinder.

On the other hand, should the points be spaced too far apart the resistance to the passage of the current becomes excessive and the spark is liable to fail to jump the gap. Approximately one thirty-second of an inch, or the thickness of a smooth dime is the correct space to be left between spark plug points.

It is a very easy matter to ascertain if a spark plug is working properly. Simply remove it, clean thoroughly, and correctly space the points. Then attach the high tension current lead and lay the plug flat on its side on the engine casting, in such a position that the end of the lead and the binding post of the plug are at least half an inch removed from any other metal part of the engine.

Testing the Plug

The plug should be so placed that the points are visible when cranking the engine. Next turn the engine over a few times, (at least as many times as there are cylinders) and note whether a spark jumps across the air gap between the points.

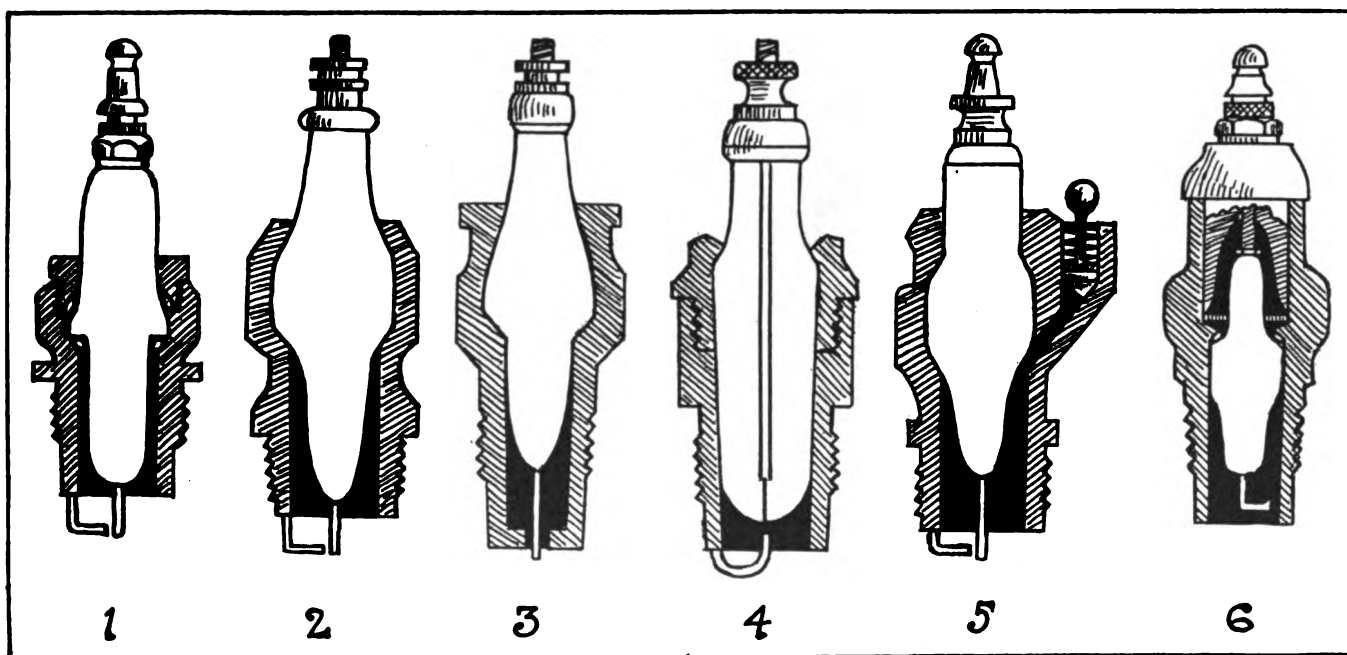


Plate A. Showing Various Types and Styles of Popular Spark Plugs

properly is the accumulation of carbon around the insulator and between the points, thus providing an easier conductor than the air gap for the passage of the current. Short circuits are also often caused by cracked

It is not sufficient, however, merely to ascertain if there is a spark, but to note as well if it is hot enough to fire the charge of compressed gas in the cylinder. This is often difficult, but usually if the spark is a heavy blue,

a bluish-white, or a "fat" yellow one, it is probably all right. If it is very thin and greenish, or showing red, it is more than likely too weak. Some idea of the appearance of a good spark can be obtained by the following procedure:

With the engine in a satisfactory running condition, loosen the nut on the top of one plug. Then start the engine and by taking hold of the insulated part of the high tension current lead move the end very slowly away from the spark plug terminal and watch the spark jump, noting carefully both its color and volume.

Observe also the distance the spark jumps, but be careful not to force it to jump too great a gap or hold it in such a position that the spark cannot jump to the plug or the engine while the motor is running, since this tends to break down the insulation of the coil. If unable to tell merely from the appearance of the spark whether it is good or not, the following crude test may be made.

The Burning Test

Insert a piece of cardboard about the thickness of a visiting card or three thicknesses of dry newspaper between the points of the plug while it is lying on the engine in the position already described, and then start the motor. A good spark should jump through the cardboard or paper, leaving a tiny burnt hole. If the spark is not sufficiently strong to do this then it is too weak to jump the spark gap in the cylinder under compression. Such a spark plug is unquestionably defective and should be replaced with a good one.

Frequently spark plugs, especially those using mica insulators, are very deceptive in appearance, since short circuits which cannot be detected in daylight are often present. By testing such plugs in the manner already

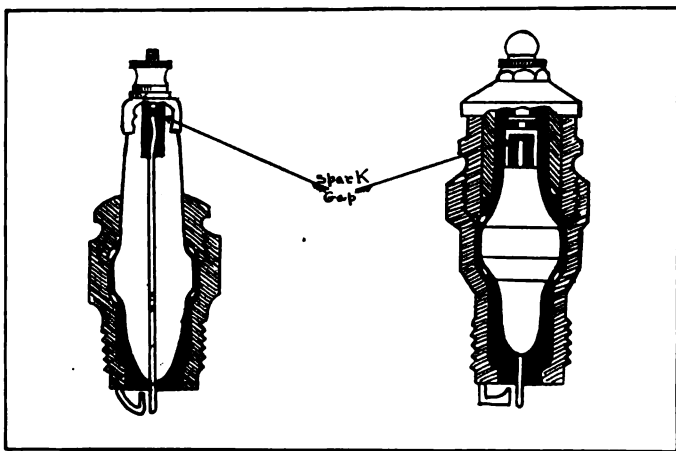


Plate B. Plugs with Spark Gaps Incorporated in Their Construction

mentioned at night, when the spark is plainly visible, the path of the high tension current can be readily followed. If the spark jumps between the points the plug is not defective, but if a number of minute sparks appear to pass between the plug body and the insulator the plug is faulty. Often this test can be made in the day time by merely shading the plug from the light with a dark cloth.

In many instances ignition trouble has been traced to the use of the wrong type of plug. The best results are obtained when the spark is delivered to the cylinder

as nearly as possible in the center of the explosion chamber. Since engine blocks vary greatly in design, it is perfectly evident that a spark plug that is suitable for one type of engine is entirely unsatisfactory for another.

Spark plug manufacturers have given this matter considerable thought and aim to produce plugs especially designed for use in different types of engines. In some engines the spark plug hole is recessed, permitting of the use of a plug of short body, while others are so constructed that it is necessary to use a long bodied plug.

From an engineering standpoint the highest efficiency

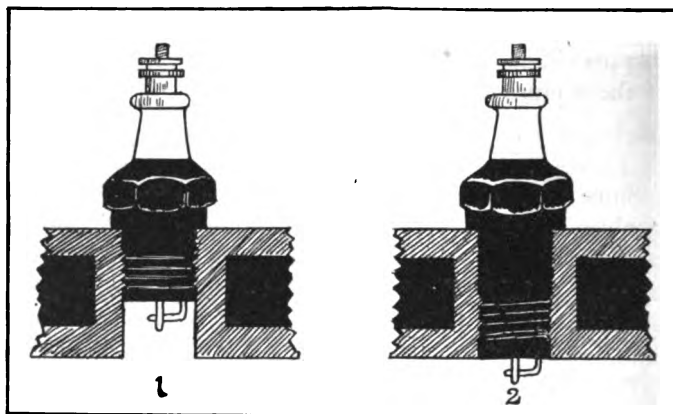


Plate C. Improper and Proper Location of Electrodes

from the explosion in a cylinder is obtained if the spark plug points project into the combustion chamber in a manner which will permit of there being entirely surrounded by cool, fresh gas. If a short bodied plug is used in an engine which requires a plug of long body, the result is the recessing or pocketing of the points, as shown in Plate C, Figure 1. In such instances dead gas is apt to accumulate around the points and cause combustion to be less rapid than it would be if the proper type of plug were used, as shown in Figure 2.

In other words, the rapid spread of the ignition flame is better promoted if the points project directly into the combustion chamber than if they are pocketed or recessed away from it. Some engine builders claim that this recessing of the spark plug is an advantage, in that the points of the plug are less liable to become fouled. This is probably true, but it is the general belief that this advantage is considerably outweighed by the loss of power due to having the point of explosion so far removed from the center of the combustion chamber.

A MERE DETAIL

A tourist in Scotland, stopping at a cottage for a drink, observed the old inhabitant attempting to chop a large log of wood with an ancient-looking axe.

"That's an old axe you've got there, isn't it, dad?" he asked.

"Aye, it is," came the reply; "it's nigh on a hundred years old."

"Indeed," said the surprised tourist, "I shouldn't have thought it was so old as that."

"A'well, mebbe it's not' exactly that," answered the old man. "It's had two new heads and three new handles since then!"—*The Lightning Line.*



WE CAN hardly imagine the operation of a repair shop without some sort of a blacksmith's forge and though we were somewhat sceptical as to whether or not this unit was actually necessary, at first, our present opinion is firmly fixed for we know that such a forge is a necessary unit.

Our experimental department forge was furnished us by the Champion Blower & Forge Co. of Lancaster, Pa. and though a larger forge might find a place in a service station, we feel that the unit which we have is ample for the average garage.

Assuming that there is much forge work to be done, then it would be entirely practical to install a number of small forges, for it is seldom necessary to heat large units in the average repair shop.

There are three important reasons for a forge in the repair shop. First, for the heating and tempering of small automobile parts; second, for the making of tools; and third, for brazing and welding jobs of certain kinds.

If the repair shop goes in for service and makes a specialty of rapid work, then the shop must be able to build certain parts such as wrist pins, small gears, studs, special bolts and so on without number.

The making of a wrist pin or special bolt does not stop with the production of the new part. The thing must be treated so that it will not wear to pieces immediately; either it must be given a thin, glass hard surface to resist wear or it must be made tough and strong enough to stand great strain. In many cases the part must be both hard and tough at the same time. Only by heat treatment is this work possible.

An ingenious workman with even a small sized forge can often accomplish wonders in the way of heat treating small parts. And unquestionably the investment in this small forge is small enough to warrant its use.

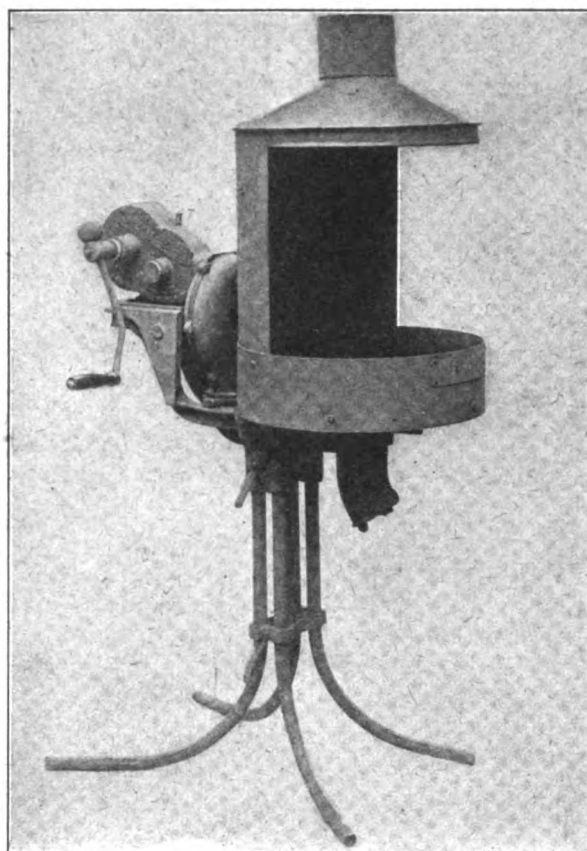
In no business in the world is the call for special tools so great as in that of automobile repairing. Go into any garage and you will find that the workman all have unique and cleverly made tools of their own invention. Lathe tools must be made and treated or the profit in a job will be lost in the cost of the tools for it. And so a forge is a necessity for this purpose also.

Patches for broken parts, iron elbows for braces, special fittings for accessories and so on are things which the real repair shop should be in a position to make and

for these the forge is practically essential.

For hammer welding and for many brazing jobs the forge is a mighty handy device and in its way it will serve in place of a blow torch for preheating parts to be welded by the oxy-acetylene flame.

Our forge is amply large enough to take care of all of this work; it is light yet strong, and though the fire



Champion Blower & Forge Company's Number 402 Forger
with Number 400 Blower

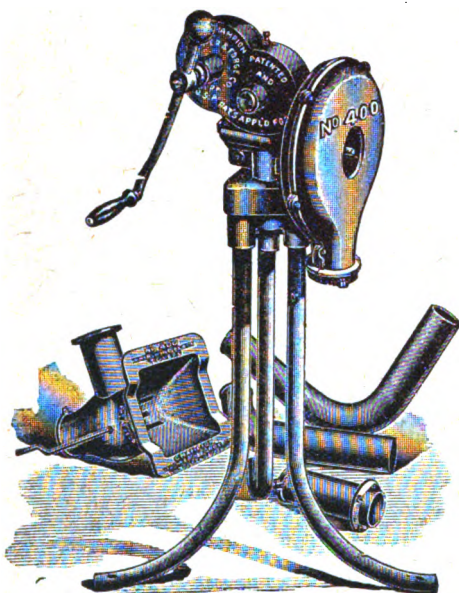
pot is of good dimensions it is not so large that it requires a large amount of fuel for operation. It can be regulated to give a small area of low heat or blown to give sufficient heat to melt many of the ordinary metals. For heating babbitt metal it is more economical than the gasoline stove.

The fire pot is made of heavy, rolled plate, the rim being riveted to the base. The inside diameter is 18 inches and the fire pot has a depth of five inches.

A piece of sheet metal, bolted to the fire pot, supports

the smoke hood at the top. The sheet metal back extends about half way around the fire pot and the hood is 15 inches from the pot, thus leaving ample working space.

The forge is mounted upon four round legs which are adjustable both as to position on the floor and as to height. The distance of the forge fire from the floor is an important consideration for it is extremely tiresome for a tall man to stoop at a low forge and a difficult task for a short man to work at a forge on a level with his armpits. The Champion forge is so made that the fire box can be adjusted to as low as 35 inches and as high as 40 inches from the floor.



Number 400 Blower Mounted Separately for Use with Brick Ovens and Forges

Our forge, number 402 is fitted with the famous 400 blower. This blower is mounted on ball bearings and fitted with an adjustable hand crank. The slightest turn of the crank develops a big stream of air for the fire and the effort required is extremely small. For a moderate fire it

is only necessary to give the crank an occasional push and the fan will operate for a time under its own momentum.

We understand that this same forge may be fitted with an electric blower if so desired. The blower is mounted on angle brackets, close to the side of the forge and the air is carried through a 3-inch pipe to the fire pot. Between the blower and the fire pot is but one joint and there is practically no chance for air leakage.

We feel that one word of caution may be necessary for our repair shop readers. Our subscribers who have had some experience with forges will hardly need our advice on this point.

A blacksmith forge is not a cook-stove and, unfortunately, there is a big problem to be encountered in the disposal of the forge smoke. The smoke in a cook-stove cannot escape but through the chimney, hence it seldom puffs back into the room; but with the forge, the smoke will go everywhere but the chimney unless the latter is properly installed.

The forge hood will not collect the smoke unless it is provided with a good stack connection. For this reason the hood must be located as near the stack as possible and the connection made with the stack as high as possible from the top of the hood. A right angle connection with the forge is a smoky proposition.

CRANKCASE OIL AND ITS RENEWAL

IN the mind of the average motorist there is great confusion as to the necessity for changing crank case oil every few hundred miles. The economical driver cannot be convinced that it is good policy to throw away two or three dollars worth of lubricant every five hundred miles and it is for his benefit that this article is published.

No matter how excellent the engine there *must* be crank case oil dilution. An engine cannot run without friction and consequently particles, or often shreds of metal will be worn off and be washed into the engine base. Carbon *will* form under the action of the heat and in time will work into the lubricant. There are mighty few cylinders which are so perfect that no fuel can work into the crank case.

The very nature of the oil is such that it will tend to lose its lubricating qualities after a time under the action of the intense engine heat. If oil does not contain carbon, then it is not a lubricant, and its carbon content will solidify in time, no matter how good the oil, if it is used in a gasoline engine.

Because of these many evils it is advisable to renew the lubricant from time to time. How often the renewal should be made depends somewhat upon the engine, but in general every 500 miles is a safe rule to follow.

At the end of 500 miles the oil is generally efficient but it usually contains considerable carbon and dirt which will only damage the engine if allowed to stay in it.

The change of the oil at the end of every 500 miles is not always necessary from the standpoint of lubricating efficiency but is advisable because of the carbon and dirt content. This being the case it is not sufficient to add new oil of a heavier grade with the idea of restoring the lubricating qualities to the old oil.

Many drivers think that they can continue to use old oil as long as it "feels" slippery to the touch. Their engines usually show neglect and the few cents that they save in oil costs are multiplied hundreds and thousands of times by more expensive bearing replacements at later dates.

One driver whom the writer knows has an evil habit of filling the crankcase with oil, running the car for 750 miles without adding new oil and then replacing the old oil with new. This may seem fairly logical but when one stops to reflect, one can see that there is a great chance for damage, supposing that fuel dilution occurs.

In such a case the fuel dilution would be proportionately small the first hundred miles but with the increase in fuel dilution and the decrease of the lubricant it is easy to conceive of a point where the crankcase might contain more raw fuel than lubricant.

The true, economical way of keeping the engine lubricated properly is to replenish the oil in the crankcase frequently and keep the oil level between three-fourths and full. At the end of 500 miles drain out the old oil and replace it with fresh lubricant.

Automobile Fuel Systems

Describing Various Types and the Common Causes which Lead to Trouble

By Edward F. Ingram



TROUBLES due to failure of the gasoline system are less frequent than those due to failure of some other systems of the car such as the ignition, and for this reason less has been written on the subject. When failure does occur, however, it puts the car out of commission just as quickly as failure of the ignition or any other system. Moreover, gasoline systems like every other part of the car have undergone considerable development which has resulted in increased complication, and while this has made for improved performance, it has necessarily made it somewhat more difficult to locate trouble when it does occur.

The gasoline system may be considered to include the tank and feed system for delivering fuel to the carburetor, the carburetor for vaporizing the fuel, and the intake manifold for conducting the mixture to the cylinders. There are three systems for delivering fuel to the carburetor in common use today, the gravity feed the vacuum feed and pressure feed.

Gravity Feed System

The gravity feed system, is of course, the simplest type and the one originally used. In its present form it differs very little from the earlier types. Gravity feed is used where the tank is higher than the carburetor, as usually is the case when it is located under the front seat or in the cowl.

In this case the system simply consists of a pipe leading from the gasoline tank to the carburetor, a valve to turn the gasoline off and a strainer, or filter trap, to prevent water and dirt from getting into the carburetor. The strainer is often incorporated in the carburetor, there being a sediment cup with a pet cock to draw off the dirt and water.

In gravity systems an air vent is always provided in the top of the gasoline tank, usually in the form of a small hole drilled in the filler cap.

There is little to get out of order in a gravity feed system. Stoppage of the air vent in the filler cap will prevent the gasoline from flowing to the carburetor. The remedy, is of course, to remove the stoppage. A stoppage may occur in the gasoline pipe. This may usually be removed by disconnecting the pipe and blowing it out by means of compressed air. The filter trap may also become stopped up, but this is easily cleaned. If trouble is experienced due to leakage of the unions, the two ends of the union should be examined to see if they are lined up properly. After these have been lined up a little

shellac may be put on the thread before screwing up the union.

In case the gasoline pipe or tank has to be soldered, care should, of course, be taken to make sure not only that the gasoline is all removed but also that there is no gasoline vapor, which is more dangerous than the liquid fuel, remaining.

Vacuum Feed System

The vacuum feed system is the type in most extensive use today. It is used where the gasoline tank is too near the level of the carburetor to permit of gravity feed, as when the tank is located at the rear of the chassis.

The vacuum tank which feeds the fuel to the carburetor is usually mounted on the dash, under the hood. The following is a description of a typical make:

The tank is divided into two chambers, upper and lower. The upper chamber is connected to the intake manifold, and also to the main gasoline line from the rear tank. The lower chamber is connected to the carburetor.

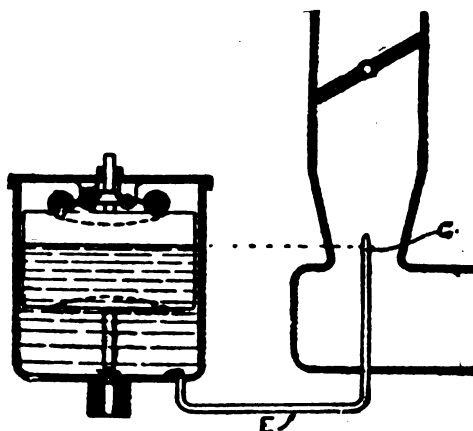


FIG. 1

The intake stroke of the motor causes a vacuum in the upper chamber of the tank, and this vacuum draws gasoline from the tank in the rear. As the gasoline flows into this chamber it raises a float.

When the float reaches a certain height it automatically shuts off the vacuum valve and opens an atmospheric or vent valve, which destroys the vacuum and lets the gasoline flow down through a flapper valve into the lower chamber. The float in the upper chamber drops with the gasoline flowing out, and when it reaches a certain point it automatically reopens the vacuum valve, and the operation of refilling the upper chamber begins again.

This same operation is repeated continuously and automatically.

The lower chamber is open to the atmosphere through the air vent, so that the gasoline flows evenly and without interruption to the carburetor. The lower chamber is so constructed as to prevent any water or sediment from flowing to the carburetor.

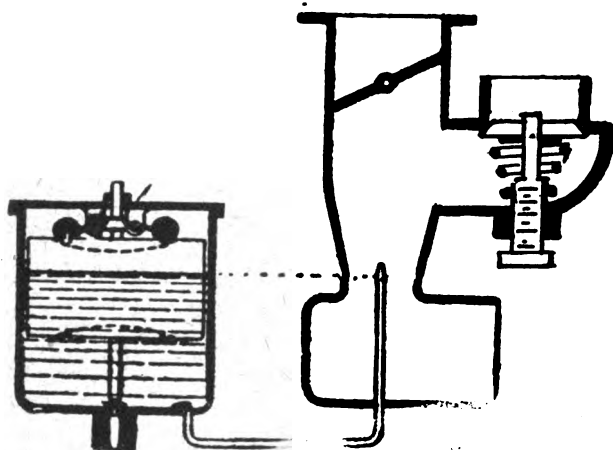


FIG. 2

If the vacuum tank is empty it is necessary to fill it before the engine can be started. In some cars a vacuum pump is provided on the dash for this purpose. In case no pump is provided the tank can be filled by closing the throttle, choking the carburetor and turning the engine over a few revolutions with the starter. If this does not fill the tank it may be that a small piece of sediment has lodged on the flapper valve and does not allow it to close.

Remove the pipe plug in top of tank and pour gasoline into the tank; also remove the vent cap and squirt a little gasoline in the top of the vent. This will in most cases wash out the dirt and the gasoline poured in the tank will run the engine until the tank starts to operate. If gasoline runs through the vent valve when squirted in the vent it is certain that this valve leaks and should be worked in with a screw driver (bearing very light) until it holds gasoline.

Engine Flooding

If engine floods or gets too much gasoline when running on usual adjustment, remove pipe plug in the top of the tank and if this remedies the trouble, it is probable that the float leaks. The car may be run to where the driver desires to make repairs by operating the tank with the plug removed. When tank is nearly empty replace the plug and allow it to fill up; then remove the plug and proceed as before. To repair the float the tank has to be taken apart.

After the float has been removed the leak may be located by dipping it in hot water and noticing where bubbles arise. After the leak has been found, punch a small hole in the top of the float, also one in the bottom near the outside edge to let the gasoline out. After all

the gasoline has been let out, solder up the leak first, then the other two holes. Use as little solder as possible so as not to unbalance the float.

The vacuum feed system usually requires little attention other than that of keeping all the connections tight and keeping the vent hole in the filler cap on the rear gasoline tank open. About every 1,000 miles the drain cock should be opened and any sediment or water that has accumulated in the trap allowed to drain out.

Pressure Feed Systems

The pressure feed type of gasoline system is still used on some makes of cars having the gasoline tank situated too low to permit of gravity feed. In this type of gasoline tank is sealed and air is pumped into it by a small pump which may be driven from the generator shaft or camshaft of the engine. An auxiliary hand pump is usually provided on the instrument board as a means of obtaining initial pressure before the engine is started, provided the air gauge on the dash shows there is no pressure in the gasoline tank.

An adjustment is sometimes provided on the engine driven air pump to regulate the pressure. If the pressure gauge indicates that the pump is not maintaining the proper pressure in the tank, inspect the gasoline tank filler cap seat and gasket to make sure that they are in good, clean condition and free from nicks and be sure that the filler cap is tightly seated. If the trouble still obtains examine all connections on the air pressure and gasoline supply lines to make sure there are no leaks.

Carburetor

The purpose of the carburetor is to blend the gasoline with a certain amount of air to produce as nearly a homogeneous mixture as possible, and in such proportions as will result in as perfect an explosive mixture as can be obtained. All modern carburetors have a float chamber. The gasoline is kept at a constant level in this chamber by the action of a float upon a needle valve. The float chamber provides a supply of gasoline to the spraying nozzle which is located in what may be termed the mixing chamber of the carburetor.

On the intake stroke air is drawn past the spray nozzle and the suction draws the gasoline from the float chamber through the spraying nozzle into the mixing chamber. The mixture of air and gasoline is drawn through the intake pipe into the cylinders, the amount being controlled by a butterfly or piston valve called the throttle.

The carburetor is a metering device which has to properly proportion the gasoline and air throughout the operating range of the engine.

There are a good many makes of carburetors on the market and as these vary considerably in design the proper methods of making adjustments also vary. The different types of carburetors may be classified according to the basic principles on which they are designed.

In order to understand the operation of the carburetor it is necessary to consider the elementary type shown in Fig. 1, which was actually used some years ago. This

type consists of a single jet or spray nozzle placed in the path of the incoming air and fed from a float chamber, the float keeping the gasoline level slightly below the end of the nozzle.

As soon as the air starts to flow past the nozzle the gasoline is drawn from it and mingles with the air, forming a combustible mixture. This carburetor works satisfactorily for an engine operating at a constant speed but, owing to the fact that the flow of gasoline from the jet increases faster than the flow of air, when the speed of the engine is increased the mixture becomes too rich.

Auxiliary Air Valve

This fact led to the introduction of the auxiliary air valve, which consists of an adjustable valve designed to open with increased suction and admit additional air above the nozzle, thus diluting the mixture (see Fig. 2). Carburetors working on this principle are usually classed as air valve carburetors. The auxiliary air valve may be controlled by a spring or weights, or metal balls of different sizes may be used to regulate the air flow. Among the makes of carburetors in the air valve class may be mentioned the Breeze, Zephyr, K. D., Ensign and one model of Stromberg.

Instead of an auxiliary air valve another design of carburetor is provided with an additional nozzle, which if operated alone would cause the mixture to become leaner and leaner as the engine speed was increased. The operation of this second form of nozzle is best understood by referring to the imaginary carburetor illustrated in Fig. 3.

Gasoline flows in a steady stream from the float chamber through passage I into well J. The jet H is connected to this well. As the engine speed is increased the increased suction at jet H does not increase the flow of gasoline because the well J is open to the atmosphere. Thus the amount of air drawn up increases while the amount of gasoline remains the same so that the mixture grows leaner and leaner.

Zenith Carburetor Action

By combining the elementary type of rich mixture nozzle shown in Fig. 1, with the lean mixture nozzle shown in Fig. 3, a uniform mixture is obtained, at different engine speeds. This is the principle upon which the Zenith carburetor operates. This compensating jet principle is now used by a great many other manufacturers among which are the Stromberg, Holley, Johnson, Marvel, Tillotson, Ball and Ball, Longuemare, Fletcher and Sunderman.

A third class of carburetors known as the metering pin type resembles the air valve type of carburetor with the addition of a metering or measuring pin, which is a tapered pin inserted in the nozzle or jet with the object of regulating the flow of gasoline. The pin is raised and lowered to accomplish this, being either linked to the throttle or operated by the auxiliary air valve.

In some cases a special metering air valve is provided

for controlling the metering pin. In this class are the Schebler, Stewart, Newcomb and Rayfield, though the Rayfield differs somewhat from the usual metering pin type.

The expanding type of carburetor is another class, a number of jets being used in this case, which are progressively uncovered or brought into action, as the throttle is opened. The Master and Carter carburetors are representatives of this class.

The proper method of adjusting the carburetor differs with almost every make, so that it is impossible to lay down any set rule for making adjustments. Before adjusting, the engine should be thoroughly warmed up. Further care should be taken to see that the ignition system is in good condition, that the compression in each cylinder is good, and that there are no air leaks around the intake pipe or past the valve stems.

Adjusting the Carburetor

When making adjustments the operator should remember that if the engine exhausts black smoke, runs sluggishly or overheats, the mixture is too rich, while if popping through the carburetor occurs or if the engine develops speed but lacks power, the mixture is too lean.

In the air valve type of carburetor there are usually two adjustments, one for regulating the amount of gasoline passing through the nozzle and the other for regulating the amount of air passing through the auxiliary air valve. Ordinarily the method of adjusting this type of carburetor is as follows:

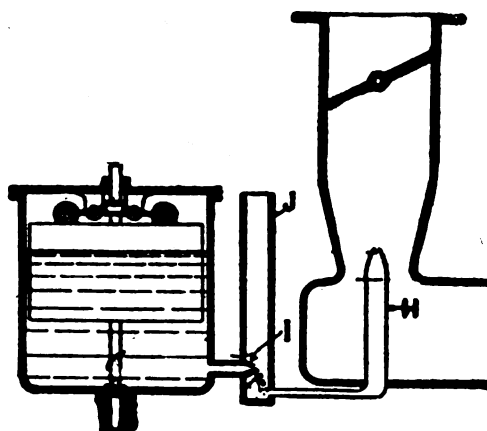


FIG. 3

The spark should be advanced about half way and the throttle opened very slightly so that the engine runs at a low speed. The gasoline adjusting screw should then be turned until the engine operates properly. The throttle should then be opened wide and the auxiliary air valve adjusting screw turned until the engine runs properly at high speeds.

If on quick acceleration back-firing occurs, this is an indication that too much air is being admitted and the air valve adjustment should be tightened. If the pick up is poor the adjusting screw should be turned the opposite way, so that more air will be admitted. The air valve should not open at low speeds.

In many compensating jet tight carburetors, only one adjustment is provided, this being for low engine speeds or what is commonly termed "idling." In this case it is merely necessary to turn the adjusting screw until the engine idles properly, assuming, of course, that the carburetor is part of the regular equipment of the car. If this type of carburetor is being fitted to the car it may be necessary to use different sizes of choke tube or jets.

In the metering pin type of carburetor, there is usually an adjustment for raising or lowering the metering pin, which gives more or less gasoline, and an auxiliary air valve adjustment. Usually about the same method can be used for adjusting this type of carburetor as for the air valve type.

Multiple Jet Type

In the expanding multiple jet type of carburetor the chief adjustment is usually an air valve or damper, by which the volume of air entering over the tops of the nozzles or jets can be regulated. All that is necessary in this case is to turn the adjustment until the engine runs properly.

It must be understood that the foregoing suggestions are only general and many carburetors are more complicated and difficult to adjust in which case it is necessary to obtain special instructions from the makers.

Sometimes carburetor trouble is not due to improper adjustment. A leaky float will cause the carburetor to flood constantly. The remedy is to solder the hole in the float, care being taken to see that all of the gasoline vapor is removed before starting the operation.

Another cause of carburetor failure is the jets becoming clogged with dirt. The remedy is, of course, to remove the stoppage. In winter water sometimes collects and freezes in the bottom of the float chamber or sediment cup causing a stoppage.

The Flooding Pin

Sometimes the choke valve provided to cut off the air and give a rich mixture for starting becomes caught in the closed position. Some carburetors are provided with a flooding pin so that the float may be pushed down and the carburetor flooded to aid starting. This pin may also become caught so that the carburetor floods all of the time.

Where a hot air stove is used to heat, heat the air before it enters the carburetor; an adjustment is usually provided for varying the temperature. This usually takes the form of a movable sleeve with a hole in the side registering with a hole in the hot air pipe. This should be opened to admit a certain amount of cool air during the summer.

Various methods of heating all or part of the intake manifold to more completely vaporize the mixture are now used. One of the first methods used for this purpose was to provide a water jacket around the manifold through which warm water from the cylinder water jacket was passed. This method is still used to a certain extent, but it is now more common to make use of the exhaust gases for heating the intake manifold.

Instead of heating the whole manifold it is now more usual to provide what is called a "hot spot" in the manifold. This is usually accomplished by so designing the intake and exhaust manifolds that at one point there is a wall in common. This point is usually located at a bend in the intake manifold just before the gas enters the cylinders, the idea being that owing to the change in direction of the intake passage the heavy particles of unvaporized fuel will, because of their greater weight and momentum, be cast against the hot spot and vaporized. As there are no moving parts in this systems there is little to get out of order.

An objection to the hot spot method of heating the intake manifold is that there is a tendency for too much heat to be furnished to the intake manifold at high engine speeds which tends to reduce the maximum power to the engine. This is due to the fact that the temperature of the exhaust increases as the speed of the engine increases.

The Packard Fuelizer

To overcome this the Packard Company uses what is called a fuelizer for heating the manifold. The device consists of a combustion jacket surrounding part of the intake manifold, a burner attached to the combustion jacket, a vaporizer or miniature carburetor which is used to furnish the mixture for the burner, and an auxiliary ignition breaker and coil which is used to furnish the spark for the burner spark plug.

The principle of this device is to take advantage of the difference in pressure existing on either side of the carburetor butterfly-valve and cause a small amount of the combustible mixture to pass through a passage which is in parallel with the main carburetor passage, burn this mixture in a suitable burner, thus heating the intake manifold, and then allow the burnt gases to mix with the incoming main supply to the engine above the throttle.

With this arrangement the maximum intake temperature is obtained at low engine speeds because the difference in pressure existing on either side of the carburetor butterfly-valve is greatest when the valve is nearly closed and this causes a maximum amount of mixture to pass through the combustion jacket. At high engine speeds when the throttle is wide open, there is little difference in pressure existing between the two sides of the throttle so that very little mixture passes into and is burned in the combustion jacket with the result that the temperature of the intake manifold is kept low.

THE REASON

"Why do you carry that umbrella, little boy?" said the kindly old gentleman. "It is not raining."

"No, sir."

"And the sun's not shining."

"No, sir."

"Then why do you carry it?"

"Well, when it's raining, pa wants it, and when the sun's shining, ma wants it, and it's only this kinder weather I can get to use it at all." —*New York "Sun."*

Our Fuel Mileage Tests

A Short Report from Our Experimental Department Comparing Various Gas-Mileages

By the Editor

SINCE we acquired our Briscoe experimental department car as an addition to our equipment we have been keeping a very accurate account of gasoline consumption and though our Editorial policy will not permit us to make any comparative statements, by name, as to the relative qualities of the various products which we test, we feel that we have a valuable message for our readers.

In making our fuel tests we have endeavored to keep all conditions as nearly as possible the same for all fuels tested. Four fuels were tested and in every case the tests cover alternate periods of 100 miles or more. The average of several tests is taken into consideration in our statements.

In order that we may illustrate the subject and be able to make the statements clear we will refer to the four fuels as fuel A, B, C, or D. The cheapest fuel, at the present time is fuel D and the following table shows the mileage given for the four fuels with the present, average cost per gallon.

Fuel	Mileage	cost per gallon	Cost per mile
A	24	30 cents	1.25 cents.
B	22	29 "	1.32 "
C	18-22	29 "	1.45 "
D	16	28 "	1.75 "

It will be seen that although fuel D costs two cents less per gallon and would seem to be a good investment, it actually costs half as much more than fuel A.

Cost of Season Run

If we consider 5000 miles per season to be a fair average then the following table will show the cost of a season's run on the same fuels.

Fuel	Cost per season
A	\$62.50
B	\$66.00
C	\$72.50
D	\$87.50

For the same amount of money as would be required to run on fuel D for two seasons, a machine could be operated for nearly three seasons on fuel A.

Although we made no actual brake horse power tests upon the various fuels, the writer is of the opinion that the fuels which gave the best mileages per gallon also gave the most power. There is a marked difference in the performance of our experimental department machines upon the two fuels A and D.

The car would drive smoothly and easily up grades on fuel A but on the same grades would lag and pound

on fuel D, so it is fair to assume that if a fuel gives good mileage it will give a good proportion of power.

Since our tests were made under normal conditions with no attempt to clean the engine or adjust the carburetor we have no means of knowing whether or not one fuel caused more carbonization in the cylinders than another. However, several tests were made upon each fuel at various times so that deposits of carbon in the cylinders would tend to bring down the average of all fuels equally did such a condition exist.

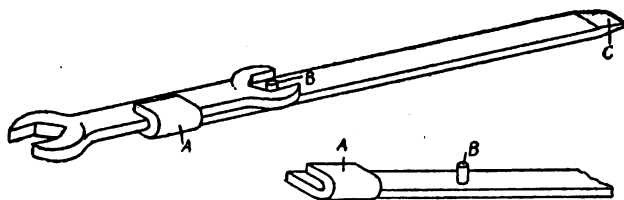
The reader may bring up the question that since he does not know which fuel we found the best, our report in this case is of little value to him. But obviously it would not be practical for us to test every fuel sold in this country or to make damaging comparisons which might result in suits against us for damage to business.

If the reader wishes to benefit by this report he will wake up to the fact that the best fuel is easily determined by his own tests. We would advise our readers to keep a record of fuel mileage and costs for the next month and be guided thereby. The cheapest fuel is the one which gives the best mileage and not always the one which costs the least per gallon.

WRENCH EXTENSION HANDLE

By Chas. H Willey

A VERY useful tool for giving added leverage to double end wrenches can be very easily made, as shown in the sketches.



A piece of flat stock A is cut and bent over at the end to hook on the wrench and a pin B is riveted into it to bear against the jaw of the wrench, as shown. The other end C of the tool, if made wedge or chisel shape is handy on tire work and prying.

STUNNING RETORT

When the woman motorist was called upon to stop, she asked, indignantly, "What do you want with me?"

"You were travelling at forty miles an hour," answered the police officer.

"Forty miles an hour? Why, I haven't been out an hour," said the woman.

"Go ahead," said the officer. "That's a new one to me."

Automobile Dealer and Repairer

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Excess Baggage

THERE is an ever increasing tendency on the part of the automobilist to pack his car with everything from a complete camp outfit to a baby carriage when he goes on the week end trip. The city autoist drives into the country and returns home with the running boards literally running over with garden truck.

The writer has never had the pleasure of seeing a touring car carrying cows or horses but he has been amused by the sight of pigs, hens and even a goat which left a trail more unmistakable than the car itself.

It is highly amusing to view these overloaded cars, for, as a general rule the reason for overloading with baggage is found in the fact that the car, previously, carried its full quota of passengers. But there is another side to the case; the outside, if we may state it in all seriousness. A car laden with excess baggage is both a joke and a tragedy and if you are a driver yourself you may appreciate both sides.

If the drivers of these cars, which are so bestrewn with excess baggage, were to use proper discretion all would be well, but sad as it may seem these drivers, some of them at least, seem to forget that other cars are on the road.

The writer well recalls one car which preceded his machine on Decoration Day. The car, a Ford coupe,

carried two grown ups and four children. The left running board carried several sacks which might have contained apples or potatoes and, sticking far out into the road, a 36 inch clothes basket packed full of stuff and apparently hanging by a single string. The basket swung back and forth with the motion of the car and it would have been extremely hazardous for any machine to have passed.

The driver of this machine was of the kind who insists upon his "rights"; not that he insisted upon keeping to the "right" side of the road, for he didn't, but he felt that he owned a certain portion of the highway and insisted upon taking his portion right out of the center of the road. This brought his clothes basket annex well to the other side and made passing from the rear virtually impossible.

Supposing that the basket had fallen off, then the driver in the rear might have suffered serious accident. There should be some law to control the excess baggage situation or soon we will be obliged to surrender the roads entirely to these fellows. Goodness only knows how two such cars could pass on a narrow road but doubtless this problem could be solved by having the drivers change cars, for most of the enroachers drive flivvers and all flivvers are alike.

Theft Proofing Automobiles

ABOUT every two weeks some man comes forward with a so called, "theft proof" automobile lock. If he has plenty of money to spend for publicity and his lock seems to have a few noteworthy features he can get it accepted by the Underwriters and perhaps sell enough of the locks to make a very creditable showing. But can any of our readers honestly say that there is a theft proof lock on the market? We contend that there is no such device.

You can lock your car in any manner that you see fit and a clever crook, or band of crooks, can get it away from its parking place in the space of but a few minutes.

Lock the ignition and the crook can short circuit the switch; chain the wheel and the thief can clip or saw the chain; lock the transmission and the car can be towed away; put a whole flock of locks on the car and the band of crooks will drive up in a truck, load your machine onto it and drive away into oblivion as far as you or the police are concerned.

To test our theories as to police protection we recently parked our car on one of the main streets of our home town, almost at the toes of a traffic officer. We left the car long enough for a change of officers and as soon as the new one took his stand we hopped into the car, dismantled the ignition switch, tinkered around upon it long enough to have short circuited the ignition and then drove away. The traffic officer evidenced only a bit of curiosity but did not investigate even though we were entire strangers to him.

If a really theft proof proposition were really worked

out there would be no need for insurance, hence the insurance companies are not at all keen for such a device.

Our various law makers have written laws to cover theft and in the State of New Jersey there is a very excellent (?) law which is supposed to make thefts of cars and their sale within that state an impossibility. (Permit us to question this as well.)

Before registering a car in the State of New Jersey it is necessary to produce a legal bill of sale. Here again we made a careful test of the law for the writer complied with this law in registering our experimental department car. Only the latest bill of sale was required and no attempt to verify the bill was made.

Under such conditions it would be extremely easy for Mr. Thief to write a bill of sale to himself, sign any name he chose and produce it when obtaining the registration.

There have been hundreds of schemes suggested and practically all of them are either silly or so cumbersome that they are impractical. The idea of maintaining a central department in which every car built is registered seems to be a fairly good one; but it would not tax the brain of a very ordinary thief to find several ways to get around such a system.

Car numbers are easily changed and the changes can be made to defy any examination. The thief, for instance, might own a Ford car and have purchased it direct from the factory. After this he could easily specialize in Ford thefts and change every number to that of his own car. A careful juggling of his bills of sale could make this car change hands once a week for years to come and there would be little chance for his detection.

To our mind there is but one simple, theft proof proposition: Make it a crime to possess a car without having a legal bill of sale, make this just as much of a requirement as the possession of a registration card. But the bill of sale would be only immediate tangible evidence of ownership, for, as we have mentioned before, any crook can execute his own bill of sale. Make it illegal for anyone to buy or sell a car which has not a clean record from the manufacturer.

In other words, to make our illustration clear, it would be necessary for you, before selling your car, to produce not only the bill of sale which you received from the former owner, but all of the records back to the manufacturer. If a car has changed hands four times, then the final owner must have in his possession four, legal bills of sale, one from the manufacturer to the first owner; from the first owner to the second; from the second to the third; and from the third to the final buyer.

The objection to this scheme might be that there are many old cars still in existence to which a clear title cannot be proven. But this can be obviated by applying the law to cars produced after the law has been passed. In a few years the theft proofing process would be complete, even though it might fail for the time being.

Another objection, just as easily silenced, is that the thief could forge the titles. But our scheme would not stop at the proof of title point. It would be the duty of the licensing bureaus throughout the country to check back on every title before granting the license to operate the car. At first thought this might seem somewhat cumbersome but a careful consideration would show it to be easily practical.

The plan would work somewhat after this order and in order to illustrate fully let us consider that the thing has been in force for two years. You have just bought a second-hand car and you go to the license bureau to register it.

First you must produce a bill of sale signed by the former owner and if the car was registered previously in your state the registrar will look upon his records, verify the signature and put an O. K. upon your application blank.

If, on the other hand the car was previously registered in another state you must either produce bills of sale in a chain back to the manufacturer or a signed statement from the registrar of that state saying that a proper transfer has been made to you.

At first, the system will take care only of those cars built after the law has been passed but as the older cars are junked the system will become more iron clad.

Suppose the system to have been working for several years and a thief steals your car. He must register the car before he can drive it upon the streets; he cannot sell it unless he can produce a clear title. But suppose he desires to manufacture or forge a clear title so that he can sell the car again.

He forges your name to the bill of sale and goes to the registrar of motor vehicles. The latter looks up your last application, compares the signature with the one forged to the bill of sale and if he is at all careful notices at once that the bill is a forgery. A word to an attendant officer and the thief is held for examination. You are communicated with and it is found that you did not sell the car.

The whole matter boils down to a similar system to that adopted for the transfer of real estate and if it is practical for a citizen to have a deed to a piece of property recorded, then it follows that the same thing can be applied just as practically to the transfer or sale of automobiles.

Russia Fails to Produce One Car

A discouraging picture of Russian industry has been presented through reports received from a group of Russian-American workers from the former F. I. A. T. works near Moscow. Although the Government has sought for the last two years to produce automobiles the factory has not made one car.—*Automobile Topics*.

Melting and Casting Brass

Describing Cheap Equipment for Producing Small, Brass and Bronze Castings in the Shop

By David Baxter



THE tremendous increase in the use of tractors and trucks for farm and city work in the last two years makes it almost imperative for the blacksmith, machinist and auto repair mechanic to know how to melt and pour his own brass or bronze into bushings and bearing stock. There are so many different size bushings and bearings required for the wide variety of tractor and truck designs that it is not always feasible for the average re-

technical side of the question as much as possible in order that any mechanic may be able to undertake the work.

In a recent issue of the Automobile Dealer and Repairer, we discussed a simple method of making bearing stock molds; which, when taken with the present discussion, should enable the average repair shop to turn out bearings of nearly any metal. The other discussion referred to, was designed mainly for use in casting bushings of metal having a much lower melting point than copper alloy.

However, the same method and equipment may be used when making brass or bronze bearings. It will not be necessary to go again into the subject of molding; the readers will do well to hunt out the back numbers of this magazine and refresh his memory, if he does not recall all the details of the process of making a mold for bab-bitt.

The present writing concerns the melting and casting of copper alloys such as common yellow or red brass or one of the various bronzes, provided of course that the correct mixture of metals is used.

Incidentally, much could be written on the subject of brass and bronze mixtures and the scientific melting

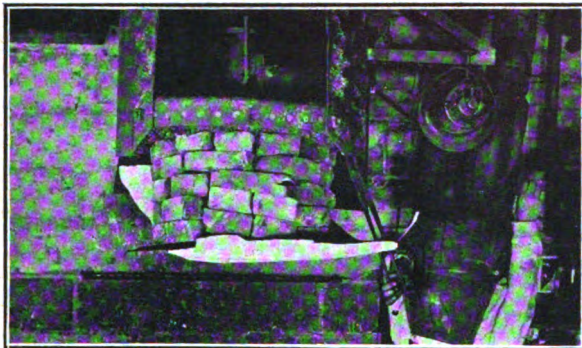


Fig. 1. A Home Made Forge for Melting Brass

pair man to carry a full line of factory made bearings. Therefore he must find some way to make them on demand.

Of course it is not practical for the small shop owner to install regulation brass melting and handling equipment, although it would be best to do so if he had large quantities to melt.

Particularly is it true that the village garage or blacksmith shop cannot afford to install modern melting apparatus just to take care of the usual run of trade, although this equipment is not entirely prohibitive by first cost if the shop draws its trade from an extensive district, that is, if the bearing trade comes from a large radius of surrounding country; possibly due to the fact that the shop is the only one in that section which makes bronze bearing stock.

However, while touching the subject of factory made brass melting furnaces, this article will deal principally with a crude "home made" outfit, such as nearly any repair man may possess if he is at all ingenious, even though his capital is restricted. In fact it is the intention to make this article an exposition of a simple but effective method of melting brass and other alloys of high melting points; using such parts of equipment as may be found in most towns.

A consistent effort will be made to adhere to the non-



Fig. 2. Pack the Crucible with Scrap Brass Before Putting It into the Furnace

thereof. It is very doubtful, however, if any of the average repair shop owner is interested in technical instruction along this line. What he wants is a practical method

which can be applied in the smaller establishments without going to any considerable expense.

In the first place, the average garage or blacksmith shop usually has on hand a quantity of scrap brass, such as valves, fittings, and discarded bearings, which could be used in making new stuff if the worker knew how to melt them. Many a mechanic has learned to his sorrow that he cannot melt brass in a common babbitt or lead ladle.



Fig. 3. Tear Down the Furnace Wall Before Removing the Crucible

Therefore, perhaps, the first instruction would be to get a graphite crucible for use in brass melting, such as is used in brass foundries, and which may be ordered direct or obtained through any equipment jobber. A crucible with thirty pounds capacity is about right for the average country shop. A larger one such as is shown in the pictures may be used.

Now, perhaps, the next important consideration is the melting facilities. Almost any blacksmithing forge can be employed, or if such is not a part of the regular shop equipment, a makeshift forge is easily constructed as is shown in Fig. 1, of the illustrations.

This device is made of a section of an old steam boiler, utilizing one of the flue sheets for a fire pot and a tee pipe for a tuyere. A motor driven forge blower furnishes the air blast through the tuyere, which is also provided with a dump grate as is clearly shown in the picture. The blower is mounted on a metal framework braced to the boiler sheet.

In absence of electric power the blower may be operated by hand, such as is the custom with many blacksmith forges. This is a quite tedious job as it often takes an hour or two to melt the metal hot enough to pour. The main essential in this process is to maintain a steady, continuous blast of air.

Other essential features are tongs with which to handle the hot crucible and some pieces of asbestos paper and

sheet iron with which to protect the workman from the intense heat of the melting-fire.

Fig. 1 also shows another device that is imperative; a fire brick wall is built up around the fire at least to the height of the crucible top. To further confine the heat and protect the operator, the crevices of this crude furnace ought to be plastered full of clay, since the fire must be extremely hot and therefore liable to prove uncomfortable. The pieces of sheet iron and asbestos are spread over the top of the furnace during the melting operation to keep the maximum heat enclosed.

A few words concerning the intensity of the heat should be inserted here for the benefit of the absolute novice. To put it non-technically, the fire must be so hot that the novice may think the crucible itself is melting, although this is not possible in such a furnace. At any rate the entire enclosure must be almost white hot. In fact the crucible must be white hot before the brass scrap will melt and settle to the bottom in a liquid pool. The condition of the melting brass is ascertained by shifting the covering and poking the molten mass with a clean iron rod.

It is not entirely satisfactory to do the melting with coal and charcoal, although it is well to kindle the fire with this. Regular foundry or gas house coke is best. In fact a supply of either should be kept on hand if the melting of brass is to become a part of the shop's regular business.

This fuel should be broken into pieces about the size of a man's fist or smaller and should be fed into the fire as fast as it settles down during the melting process.

In the melting procedure, after building the wall around the fire, which, by the way, should be large enough in diameter to provide a space of from four to six inches

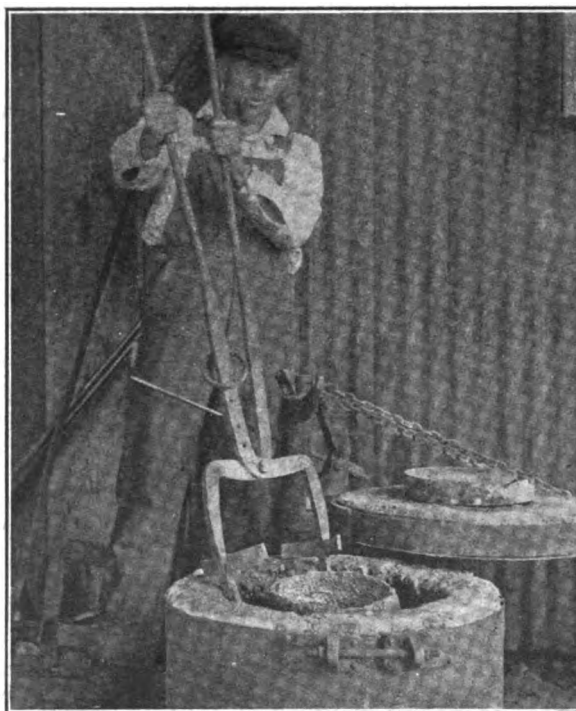


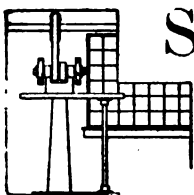
Fig. 4. Modern Brass Melting Furnace and Crucible Tongs

around the crucible, the first thing to do is to pack the crucible with the brass scrap. If any attempt is made to

(Continued on page 62)

TIRES & REPAIRS

PUNCTURES



SINCE this is a new department in this magazine it is only fitting that we begin with the more simple subjects rather than to launch out with a highly technical description of a tire vulcanizing process. To our mind the matter of punctures is really the one which deserves first consideration.

The car owner may start driving his new car with the promises that he will be forced to repair one puncture for each 500 miles of driving. With this foreboding in his heart he drives for about 1500 miles without a bit of tire trouble and is beginning to tell his friends how silly they are and that "It's all in the driver"; that a really good, superfine driver need never fear a puncture and he proudly points to his 1500 mile record. And then unkind Fate puts her sharp finger upon his car; one after another four tacks attach themselves to vital and strategic points and the booster saves his wind for tire inflation purposes.

Punctures Are As Sure as Fate

The writer is a fatalist on this puncture proposition. If he doesn't collect his due proportion of tacks he almost feels abused for he knows that the good old law of averages is simply saving up for a rainy day, figuratively and literally.

There is something sinister about the hiss of a punctured tire; somehow or other it makes you feel that it is but the beginning of misfortune. A blowout is final and, like the bursting of a bomb, you hear the worst and realize that the thing is done, once and for all. But with the puncture your troubles have only commenced. You seldom are sure that you have patched the right hole. You cannot be sure that the patch will hold under the strain of driving. And if you don't happen to find the cause of the trouble you cannot remove it—hence you worry for the next month.

Stop Gently

As soon as you hear the sibilant hiss of a punctured tire, cut off the power and gently stop the car, for if you apply the brakes with vigor you are bound to slip the deflated tire and generally cut the tube in several places or, perhaps, shear off the valve.

Before you even start to remove the tire locate the puncture if you can because if the tack is still in the

tire you should remove it immediately or it may cut the tube as the tire is being removed. If the tack is not there try to find what has caused the puncture. A nail often drives itself into the tire so far that it can hardly be seen.

Measure the distance between the puncture and the valve so that you can locate the hole in the tube without blowing up the tube when the latter is removed.

If you have been wise enough to have found the cause before you remove the tire you will have saved yourself much worry. If you find that a long nail or piece of wire is the cause you realize that perhaps the thing has pushed a hole not only through the outside of the tube but the inside as well and you have two places to patch.

Several Punctures from One Nail

A single tack or nail may often cause several punctures. The first hole allows the air to escape and the shoe naturally is released from its pressure upon the rim. The application of the brakes tends to slip the shoe slightly and the tack punches a second hole. Every revolution thereafter slips the shoe and the tack does the rest.

Take the tube out of the shoe and locate the hole. This is not always as easy as it sounds for a small pin-hole is as elusive as a wild flea on a Bolshevik or the proverbial needle in the hay-mow. It is all right to tell the green driver that he can locate a puncture by blowing up the tube and immersing it in water, but just for purpose of argument we will suppose that conditions are normal and that the puncture has occurred on the road and not in the cellar.

Locating the Hole

Blow the tube up until it is distended about 1-3 more than its normal size. (A good tube will stretch to double its size, but there is no reason for straining it.) The stretching of the rubber will open the punctured hole and as a general rule it is easy to locate it by putting the ear close to the tube and sliding the tube through the hands. A fine stream of escaping air will sound like Niagara Falls when it blows into your ear.

After finding one puncture in the tube don't be optimistic. Always figure on two punctures and then if you cannot find the second the disappointment will be a pleasant one.

As soon as you have located the hole, or holes, with a pencil make four arrows on the tube at a distance from

the puncture, and all pointing toward it as a center.

Next remove the valve insides and roll the tube into a flat circle being sure that the puncture comes at the middle of the flat surface. This procedure will press out all of the air and when the tube is fully rolled, replace the valve inside and no air can get in again. It is much easier to work upon a flat tube than upon one which is baggy with air.

The next step is vitally important for upon it hangs the safety of the tube and the strength; we speak of the cleaning process. Many autoists think that the tube should be given a bath in gasoline and they soak on as much of the stuff as the tube will dissolve. The consequence of this foolishness is not hard to predict, for in a comparative short time the tube will tear around the patch where there is a greater strain and where the rubber has been "killed" by the gasoline.

The cleaning process should be made just as brief as possible. First wipe, or rather scrub, the surface with a clean cloth. Then wet a corner of the clean cloth in gasoline and wipe the surface with it, but without scrubbing. The surface to which the patch is to be applied should next be roughened slightly with clean sandpaper, not emery cloth. We do not mean to infer that the surface should be scraped away—not at all, but merely rubbed over once or twice to take off the gloss.

There are many kinds of patches which are easy to apply on the market and the writer is safe in saying that nearly every one of the more popular brands will give satisfaction.

The linen cover is removed from the patch, the face of the raw rubber moistened with gasoline and then firmly pressed over the puncture.

(Continued on page 60)

Case Hardening Steel

How To Put a Thin or Thick Cover of
Glass Hard Surface on Small Auto Parts

By J. F. Springer



WROUGHT iron with no carbon is very pliable. Then as a little carbon and a little more are added, we get soft steels that are less pliable. And so on. As the carbon is slowly increased, the pliability is decreased. As we get up to tool steel, the pliability has considerably decreased—that is, the change in the direction of brittleness has gotten on a good ways. All this is true even with the steels in an annealed condition. If they have been sufficiently heated and then hardened by quenching, the loss of pliability or the change to brittleness will be even more apparent.

Now, this is what the repair man must keep sharply in mind when he proposes to substitute a case-hardened tool steel part for a broken case-hardened soft steel part. The case-hardened tool steel part will be hardened all the way through, because all high-carbon steels are hardened by heating up to something beyond a medium cherry red and then quenching in water or oil. This means that the skin or shell of very high carbon steel will be hardened at the quenching and also that the interior high-carbon steel will be hardened at the same time.

This means, too, that the interior—that is, the main body of the piece—has undergone a change in the direction of brittleness. It will not be brittle like a razor blade. Steel containing around 0.80 or 0.85 per cent of carbon may be used for rock-drill bits. That is, when hardend, this steel will stand considerable rough usage.

Let the repair man consider whether the new part which he thinks of making from tool steel will be subject to shocks much when in service. If it will, then

he would do well to go slowly in substituting a case-hardened tool-steel part for one made from soft steel. But, if there will be no sudden shocks, then the proposition of making the new part from a tool steel containing, say, 0.90 per cent of carbon may be considered as approved. Then, he may very well consider the question of danger. What is the hazard, if the new piece should break?

If, after thinking the matter over very carefully and after having consulted the owner, he concludes that it is all right to put in the tool-steel piece, he will doubtless find that his work will be lessened. The case-hardening may be done in a box and may be rather quickly done. The steel already contains, say, 0.90 per cent of carbon. A thin skin may soon be impregnated with enough carbon to make this skin a shell of steel containing perhaps 1.50 per cent of carbon.

When this impregnation is over, the part may be heated and then quenched. Everything will harden, inside and out. The inner part will become something like rock—drill steel, and consequently be able to resist even moderate shocks.

May be Oil Quenched

A great advantage of the method which uses tool steel of, say 0.85 per cent carbon, as the basis, and then impregnates this steel on the outside with an added amount of carbon by the use of a box and packing material—a great advantage of this process consists in the fact that when it comes to applying the hardening treatment, oil may be used instead of water.

The repair man should not overlook this advantage, nor should he fail to understand it. It is often very

desirable to have as *tough* an interior as possible. Naturally, in the present case, the core itself being a tool steel, we cannot expect the toughness of a low carbon steel. At the same time, the quenching in oil tends to keep the tool steel from becoming brittle.

One is not limited to the tool steels having a carbon percentage round 0.90. Higher carbon percentages are permissible, insofar as the method itself is concerned. We may use steel containing 1.20 or 1.25 per cent of carbon and give this a skin of a still greater carbon percentage. But the repair man will do well to go slowly in putting in a part made from steel containing as much as 1.25 per cent. Even with the oil quenching, such steel will probably have quite a good deal of brittleness.

How To Do It

The temperature required in the present process where the steel constituting the article is itself a tool steel of moderate carbon percentage—say, 0.85 or 0.90—is much lower. That is to say, we may heat the article to 1375° or 1400°F. This is a temperature indicated by a *full cherry red*. It is a heat higher than medium cherry and yet not so high as a light red.

The articles to be hardened are suitably packed in an iron or steel box. This "box" may be nothing more nor less than a short length of pipe which has been closed permanently at one end and temporarily at the other. This latter end may be provided with a cap and the cap may be luted on. That is, the crevice may be sealed with a mortar or mud made of fire clay.

The material used for the packing should surround the article on all sides and on each end. One and one-half inches of packing between the article and the box at every point is a good rule. It will be all right if there is a greater thickness everywhere or at some places. But see to it that no place has less than the one and one-half inches of packing material between it and the box.

Heating the Box

When the whole is ready, it is placed in the heating chamber of the furnace. Some time will naturally be required for the steel article or articles *inside* the box to attain the temperature of the full cherry red. After this heat has been gotten, a skin of high carbon steel will probably be in existence in two or three hours. How thick this skin will be, one can hardly tell. So much depends upon various factors, such, for example, as the character of the packing material.

The repair man may use his judgment to the best possible advantage. If a thicker skin is desired, the heating is to be prolonged. Only that heating is to be counted which occurs *after* the full cherry red has been gotten.

Now, the reader must not make any mistakes here. It is not the heat of the box that counts. It may be a light red, and the article inside may be just turning a cherry red. What is wanted is that the article itself should be a full, cherry red, and should be maintained thus for two or three hours or longer.

The question arises. How shall this be determined?

One way is to provide "tell-tales." In the present case these tell-tales may consist simply of wires. These may be stuck in in such way as to have an end sticking outside. This projecting end may be bent round to form a hook or an eye. With wires having eyes at the outer ends, it ought not to be so hard to tell how things are inside. A rod or wire with a hooked end may be thrust into the furnace and hooked into an eye.

The tell-tale is then withdrawn and its color properly noted in a dark place. The wires may be placed close up to the work and thus made to show what the heat is inside. If only one hole is desired a single wire tell-tale may be used. After setting the temperature, one acts accordingly. If the heat is not high enough, one waits awhile. The heat after it is once obtained is to be maintained steadily. One may wish to look at a tell-tale now and then, in order to decide whether the temperature is being kept up. A steady heat for the whole time after the proper temperature is gotten, is what is wanted.

A caution should be added at this point, perhaps. When we heat up the box and its contents to get the articles inside up to the full cherry red, we must remember that the tell-tale may have the heat before the article, especially if the article has some thickness and the tell-tale is only a wire. Consequently, it will be best not to begin to count the impregnation period until some time has passed after the tell-tale shows the full cherry red. It is not necessary that the tell-tale shall be of the same class of steel as the work. We are using it to test *merely temperature* and not the carburizing.

Use Thin Test Rod

It is hardly desirable to use a thick rod, as this would require a considerable hole; unless the rod is made to fit the hole pretty closely, or the hole made to fit the rod. The wire or rod may be long enough to reach to the furnace door or even to project outside. One is probably enough, provided it is made long enough to make it easy to put it back after it has been withdrawn and inspected.

Note the color in a dark place. If there is no such place close to the furnace, rig a place.

The packing material may be any one of several varieties. Bone usually contains more or less phosphorus, and so is undesirable. The phosphorus is not wanted in the steel and so the packing material should be something else. However, if some kind of bone has to be used, because of some reason that can not be controlled, then charred or burnt bone is better than the raw, unburnt article. Sulphur is also to be avoided.

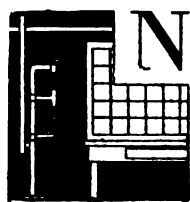
It is said that for steels up to those having 1.20 or 1.25 per cent of carbon, *charred leather* is a good packing material. The repair man will perhaps but seldom have a case where he is going to case-harden a tool steel containing a still higher carbon percentage. But if he should have such a proposition before him, then he will do well to let the charred leather go, and substitute

(Continued on page 64)

Nuggets of Automotive Wisdom

A Peep at Some Automobile Repair Work
as It Passes Through the Machine Shop

By Joe Bell



NOT long ago an AUTOMOBILE DEALER AND REPAIRER correspondent asked about putting in bushings for valve guides. A leak of air around the valve stems results in jerky running at slow speeds and too high gas consumption. There seems to be no set rule as to wear—on one car it will be the valve stems that wear, on another, it is the guides, and on a third, it may be a combination of the two.

The seat of wear determines the mode of treatment. If it is just the valve stems, new valves will cure the trouble. If it is the guides that have worn or both guides and stems, bushings must be put in. Sometimes it is possible to get

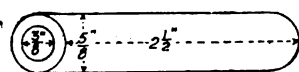


FIG. 1

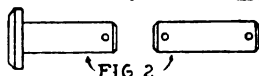


FIG. 2

valves with an over size stem and in that case, the guides may be reamed out to fit.

But often the only way is new valves and bushings, as was the case with a country doctor's 1910 Chalmers that we fixed up. He got a set of new valves all the way through and then brought in his two cylinder castings to be fitted with bushings.

And such cylinders! The doctor was the third owner of the car, which is a good example of how four big cylinders with slow running pistons can wear. The bore was $4\frac{1}{4}$ inches and there was not a scored cylinder nor one that was worn more than .005 of an inch over the original nominal size. (May the day come when we return to this rational design in engines!)

The doctor had determined that both stems and guide holes were worn and that the cylinder castings were not bushed. He had sent for a new set of valves and the Chalmers people sent him valves with a standard $\frac{3}{8}$ inch stem, which were all they stocked for this (rather old) model. Our task was to enlarge the guide holes so a bushing of substantial thickness could be put in and to make those bushings.

Five-eighths of an inch was the best diameter to make, all things being considered, and the cylinders were clamped to the table of a drill press in first class condition for the work of enlarging. By careful working, all the holes were put through in line within reasonable limits, drilling first and following the drill with a reamer.

Fig. 1 shows the kind of bushings that were made up. Nine of these were machined out of cast iron—the extra one being made up with the batch as a safeguard against errors, for it costs very little more to make one that way while it would cost at least double if it had to be done

afterwards to replace one that was too loose a fit or showed a casting defect. The bushings were turned .000 $\frac{1}{2}$ of an inch larger than the reamed holes; this is enough to insure a light press fit on a piece of this diameter and such proportionate long length.

If the cylinder casting had been heavier, the turned diameter could have been greater and the machinist would not have had to work to such close limits but cylinder castings are chambered out at every possible point to save weight, with the result that their resistance to such a force as a heavy press fit is much reduced.

These bushings were made about 1-32 inch shorter than the length through the holes. When pressed home, the edges of the surrounding casting were hammered over slightly to provide additional means of keeping the bushings in place. In pressing the bushings home, their bore was squeezed up a trifle so that a hand reamer scraped a little dust off as it was passed through—enough to allow the valve stems to slide nicely.

By spotting the valves in place, it was shown how closely the original drilling came to being centered on the valve seats—in this case, six seats lined up ready to grind and the other two could have been ground in but it was quicker to use a re-seating tool first.

* * * * *

MANY people come to us in the course of a year to get new pins made for their brakes—car owners who are doing their own overhauling and have found these little parts badly worn (as they usually are) while the rod and fork ends are all right.

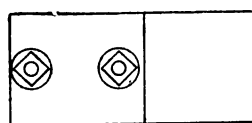
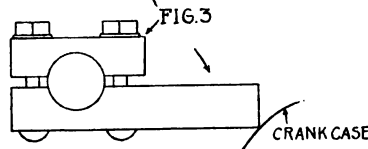


FIG. 3



CRANK CASE

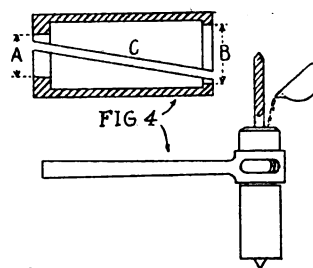


FIG. 4

The conventional pin for this purpose is turned from bar steel about a quarter larger than the pin part, appearing like the upper drawing in Fig. 2. At the end opposite the head, there is drilled a cotter hole. Now, if a cotter will suffice at one end, it will at the other and we always urge customers to accept the pin shown by the lower drawing.

Oftentimes a man has a drill of his own and, in that case, we merely sell him a piece of, say, $\frac{3}{8}$ inch cold drawn steel and he saws off the pins to length when he gets

home, drilling them after he has filed the chamfered corners. It certainly is as good a job as the other style, so far as utility is concerned, and much cheaper.

* * * * *

ANY number of correspondents ask what to do about a knock in the front end gears—and garage mechanics would be idle much of the time if it were not for the fussy people who insist on putting in new gears to take out this knock. It all comes about through the pump shaft, as it is commonly called, which usually extends back and drives the magneto or generator.

As the armature coils revolve between the fields, there is an alternate pulling and releasing that acts to hold the pump shaft momentarily and then release it so suddenly that it jumps forward until grabbed by the fields again. The work that the pump has to do is less than enough to prevent this springing forward every time and so the shaft springs forward (ahead of the speed of rotation) until the front end gears meet.

New, close fitted gears and bearing would not permit this but resultant wear in a used car creates backlash that allows the knocking from the cause named above. New gears may help but they won't help unless the shaft journals and bearings are in first class shape.

To prove that this is the cause of the trouble, a stick may be held against the shaft as the engine is run. Should this stop the knock—and in most cases it will—a simple form of brake may be constructed to act permanently as did the stick. Fig. 3 shows one way of doing this.

Two blocks of hard wood are joined by carriage bolts and are bored to suit the shaft, over which they are clamped as shown with the long end resting against the crank case or the car's frame. Readers will recognize in this construction the Prony brake of the engineering laboratory and, like the latter, the clamp screws do not want to be set up too tightly.

Just enough pressure should be given to subdue the knock—otherwise the blocks will overheat and char. This same "stunt" is performed with a length of worn brake lining which is carried around the shaft and one screw put in to close the loop and the free end attached to a frame bolt.

* * * * *

IT IS very seldom that a full line of tools is available when making auto repairs. This applies to drilling as well as to other operations—there are ratchet and breast drills, electric drills, and drill presses—some with square sockets to receive a square ended drill and some with chucks while others depend on the taper recess in the end of the drill press spindle to hold the drill. Then, to work in these various tools and types of holders, we have the drills themselves which may be straight shank, taper shank, or blacksmith drills. To co-ordinate this equipment is the problem.

Fig. 4 shows how a twist drill may be driven in a ratchet. It is held by hand or blocked upright in the square-socket end of the ratchet and babbitt or lead poured around it. No other mould or preparation is needed. The

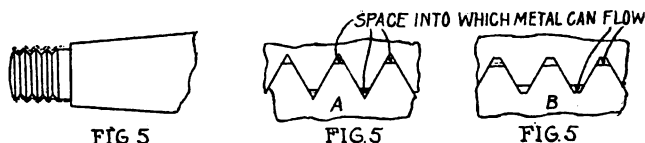
shank of the drill should have a notch filed in it or else be flattened out on the end—this makes a positive drive and the drill can be used for quite heavy work. Some places keep a set of small twist drills with the babbitt sockets on them just to have ready when a job comes along where nothing but a ratchet will do.

When it is required to use a taper shank drill in a chuck, some sort of an adapter must be used. (Chucks are made for straight shanks and a taper shank drill in one will wobble all over.) There are adapters or sockets on the market for this purpose but a simple home made one is shown by Fig. 4.

Anyone with a lathe can make this accessory, which is about the neatest thing for the purpose the writer has seen. It is merely a plain cylindrical shell with a hole tapered to fit the drill shank and with a diagonal split lengthwise. The split allows the shell to change diameter slightly. This shell can be made out of a solid bar or a piece of tubing and if the workman is not very slick at boring taper holes he can recess the interior all but a short length at the ends and these he can make into diameters A and B to fit corresponding points on the drill shank.

* * * * *

A FELLOW brought in the left front wheel spindle of his Buick to see if there was any way to repair the threaded end. The nut and the end were both stripped and the only thing that had kept the wheel from coming off had been the cotterpin. The threaded end was $\frac{5}{8}$ inch by 18 and fortunately the 9/16 inch S. A. E. standard has the same number of threads to the inch, so it was possible to "catch" the old thread with the lathe cutting tool and recut to 9/16 inch size, obtaining a full, strong, smooth thread. A stock 9/16 inch castellated nut was fitted to the end and the knuckle was as good as new.



The amount removed was so little that the part was weakened a negligible amount. That is one nice thing about the S. A. E. standard—there are the same number of threads per inch for two diameters in several cases—with U. S. standard threads, it is usually necessary to turn off all the old thread before cutting a new one because the two spirals are not alike, or else depart from standards and make a special thread in the nut. Good practice does not tolerate specials when there are recognized standards covering the application.

Referring to the worn spindle threads as an example, many parts of a car are subject to the same trouble though the nuts may never have been screwed off until discovered too near stripped to hold. This occurs either through an oversight in parts inspection or (more likely) through the modern system of assembling.

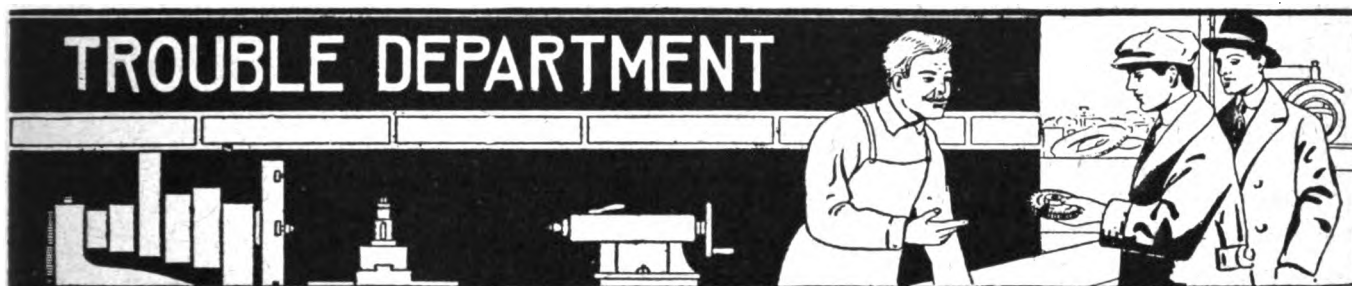
If the nut had been a tight fit on its thread originally—what is called a "monkey wrench fit"—it would never have lost its threads or those of the spindle but it was not and

it could not have been so made and assembled with the ease and speed the assembly line requires—therefore it was a hand fit and in the course of thousands of miles running, this little looseness was aggravated by impact shocks until the tops of both threads were knocked completely off. Needless to say, the new threads on this spindle were cut large enough to be a real tight fit in the nut.

Fig. 5 shows by dotted and full lines how the $\frac{5}{8}$ inch thread was cut down. Above this, the drawings A and B show respectively how V threads and U. S. shape threads may be cut to make and retain a tight fit. This is a trick worth knowing when a tight thread is desired on a part where the male and female members must be separated occasionally without losing the fit. Workmen avoid the wrench fit because threads are often torn and spoiled

in trying to force parts together.

It is manifestly impossible to screw together two pieces which differ radically in size but, according to the diameter, from .002 to .015 may be left for "running in" with the wrench AND oil if there is left a space at both top and bottom of the threads. At A and B, this space is shown. The metal can flow into these spaces when the parts are being screwed together—it doesn't always do it so the change of form is visible but that is the theory anyway. With the piece held in a vice, put plenty of oil on the thread and work the nut on with a wrench—you will find that you have a tight fit (the kind you should have for the jars of road work) and that you can take the nut off and on an indefinite number of times without changing this fit.



Using Old Auto Generators

3118

From C. W. Shorman, North Dakota: I have a Simms-Huff Motor Generator which was removed from a Maxwell car and I would like to charge a storage battery with it, driving the generator from a small gasoline engine.

Now I have connected the generator with the gasoline engine and my trouble is that the generator works too well. Normally it generated 7 volts and 15 amperes but when driven by the engine it will burn out six volt lamps as fast as I can connect them. It also burns out two, six volt lamps in series, so I assume that it is generating more than 12 volts.

I have tried a number of connections and none seems to work in the way the thing should. Can this generator be used for charging my battery and how should it be wired?

Reply: This is a question which might well have been asked by many of our readers and though it applies specifically to the Simms-Huff generator, we will try to make our answer broad enough to cover many other makes of generators.

We feel that it will pay our readers to buy separate generators for battery charging, especially those of the readers who drive their cars considerably at night.

When you purchase a generator or a motor-generator of the type commonly used on an automobile you must realize that you are, in a way, buying a "pig in a poke." You don't know whether it is a fat pig or a lean one, whether it has four legs and a tail or if someone has removed the head to make cheese from; in other words you are taking a chance on getting an apparatus which will produce results and on getting a complete unit.

A complete generator outfit includes three things, a machine for producing current, a unit for regulating the current and a "safety-valve" arrangement called the "cut-out." Without these three things the outfit is not complete nor should it be used unless you wish to take a chance on damaging the battery.

The secondary consideration is the driving power and the speed of the generator. Naturally the generator is designed for a certain speed and it is a waste of energy to drive the generator faster than normal, and if it is driven slower it will not generate sufficient current. The average generator is designed for a 15 mile per hour car speed and it is usually safe to assume that at this speed the engine is running between 1000 and 2000 R. P. M. Thus the cam-shaft and usually the generator shaft runs at between 500 and 1000 R. P. M. A good average is 1000 R. P. M. and though this may be slightly fast, it is better to err in this direction than to have the generator run too slowly.

Having found a means for driving the generator at between 700 and 1000 R. P. M. comes the question of wiring and regulation. The third brush type of generator is self regulating within reasonable limits. The third brush type of generator usually has two wires leading from it, or one wire and the ground to form the return circuit.

With the third brush type of generator you will need to use only the cut-out. Run one wire to the cut-out and the battery. Make a tap into this wire and connect one side of an ammeter with the wire. Connect the other side of the ammeter with a six volt light bulb and touch the other pole of the storage battery. With this test the ammeter should indicate either "charge" or "discharge"

because the current is running from the battery through the ammeter and light bulb back to the battery.

If the ammeter indicates "charge" reverse the ammeter connections so that it will indicate "discharge." Next start the generator and run it at as low a speed as possible. (By throttling down the motor or gas engine). Then connect the test wire with the other wire from the generator. The current will then run from the generator through the ammeter and light bulb back to the generator. The ammeter should then indicate "discharge." But, on the other hand, if the ammeter indicates "charge" it means that the two wires from the generator are not properly connected, so remove the wire which you originally connected through to the battery and substitute the other generator wire for it.

To this point you have simply tested to find the proper positive and negative generator terminals. (Assuming that no terminals are marked.)

Once you have established the proper wire from the generator to one of the battery terminals it is only necessary to make the proper cut-out connections. With the generator still running slowly touch one of the two remaining cut-out connections, if there is a spark formed it is safe to make a connection and speed the generator up for a second to see that the cut-out points come together. The remaining cut-out connection goes to the other battery. When you get through you will have one wire leading from the generator to the cut-out and battery; a second wire leading from the generator to the cut-out and a third wire leading from the cut-out to the battery.

Naturally, after you have established these connections properly you will need to put the ammeter between the cut-out and battery so that you can tell how rapidly the battery is being charged. A variance of a few volts is immaterial so long as the generated voltage is over 7 volts. The amperage may be anywhere from 4 to 15.

If, however, the generator is not of the third brush type, then you will need some sort of current regulator. An ordinary rheostat placed in the fields of the generator is an ideal system of current regulation.

In the Simms-Huff generator the current is regulated through the fields. You will find three wires coming from the generator, or on some models only two, but on the latter the base of the generator is supposed to carry the return current.

In testing out any generator which has two or more wires leading from it, it is necessary to find the inside connections. We have not the space to consider all types of generators, but can give you a plan of action for testing your Simms-Huff generator.

With the generator running at about 300 R. P. M. and not over 500 R. P. M. touch the wires, in pairs, together. (We assume that one of the wires is connected with the frame). Two of the wires should give a good sized spark because they carry the current through the armature and fields. Connect these two through some sort of a rheostat and you will have the current under full control. A combination of the other wire with one of these, or a combination of the two other wires will give the charging

current. Lead the charging current through the cut-out to the battery and you can control the charging current by putting more or less resistance in the fields.

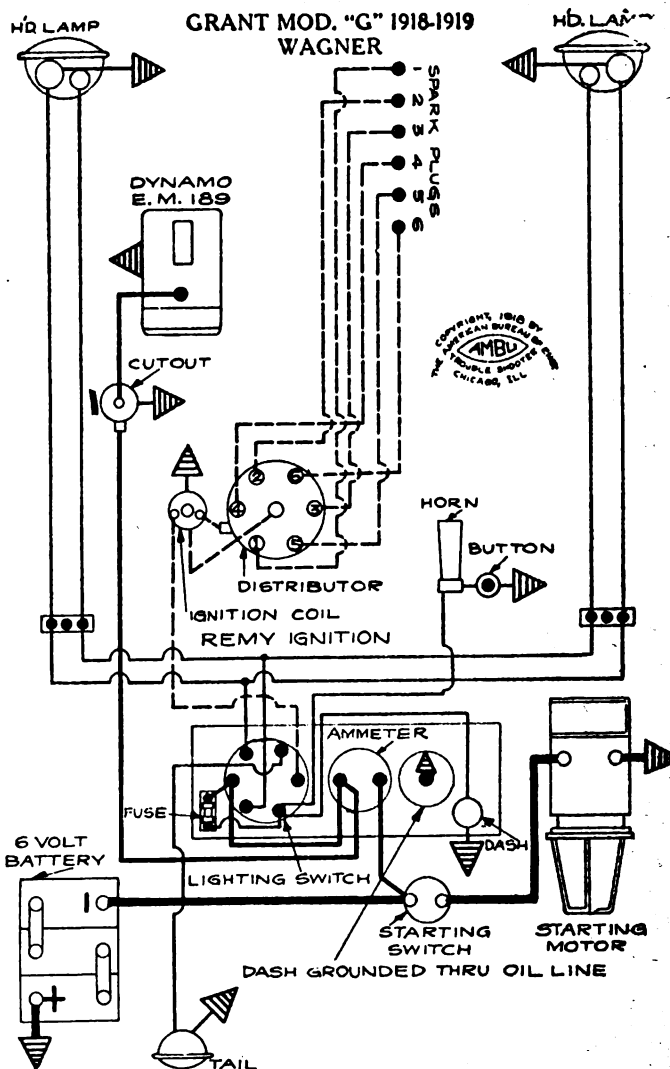
By going over this complete letter you can pick out the tests to fit your case and thus wire up the complete apparatus. After the wiring is complete, with the ammeter between the cut-out and the battery, watch the ammeter and as the generator is slowed down see that the ammeter drops back to zero and does not, at any time, indicate discharge. If it should indicate discharge simply increase the spring tension which pulls the cut-out points apart.

Wiring of Grant Model G Car

3119

From H. W. Howard, New York: Will you kindly print in the next issue of your magazine a wiring diagram of the Model G, Grant car? This was a late 1918 car and was equipped with a Wagner starting-lighting system and Remy Ignition.

Reply: The wiring diagram requested is printed below.



Wiring of 1915 Mitchell

3122

From J. F. Parkington, Illinois: I have a 1915 Mitchell car, four cylinder, equipped with Splitdorf-Apelco starting-lighting system, and would like to obtain a wiring diagram of this machine. Can you furnish me with such a diagram?

Reply: The wiring diagram requested is printed at the bottom of this page.

Burning Out Carbon

From Geo. B. Gardner, Massachusetts: Will you kindly publish what you think of the process of burning out carbon in the combustion chambers of the automobile engine?

I have spoken to some garage men who say that I should not have it done; that it might burn the valves. Another said it would burn the gasket and make it leak.

On the other hand, a man who makes a business of burning out carbon said that what these men said was not so; that the heat was no more than was generated by the explosions and that he knew how to handle the operation so that it would do no harm.

What is your opinion?

Reply: The only objection that anyone can have to the process of carbon burning is that in the hands of a poor mechanic all of the carbon will not be burned out and if some of it is left, the carbon will form very rapidly.

During the burning operation the water is left in the radiating system and the piston in the cylinder which is being burned is to be at the top of its power stroke so that all of the valves are closed. When this is done there is absolutely no chance for burning the edges of the valves or harming the engine in any way.

The heat generated is even less than that which is generated under ordinary running conditions. You need not worry about having this work done. If, however, you have the time, it is advisable for you to scrape the carbon out yourself, because a scraping job is usually superior to an ordinary burning job.

Overheating of Chevrolet 1918

From C. W. Mueller, New Jersey: Can you tell me what the cause is of the overheating of my 1918 Chevrolet F. A. model which I recently overhauled?

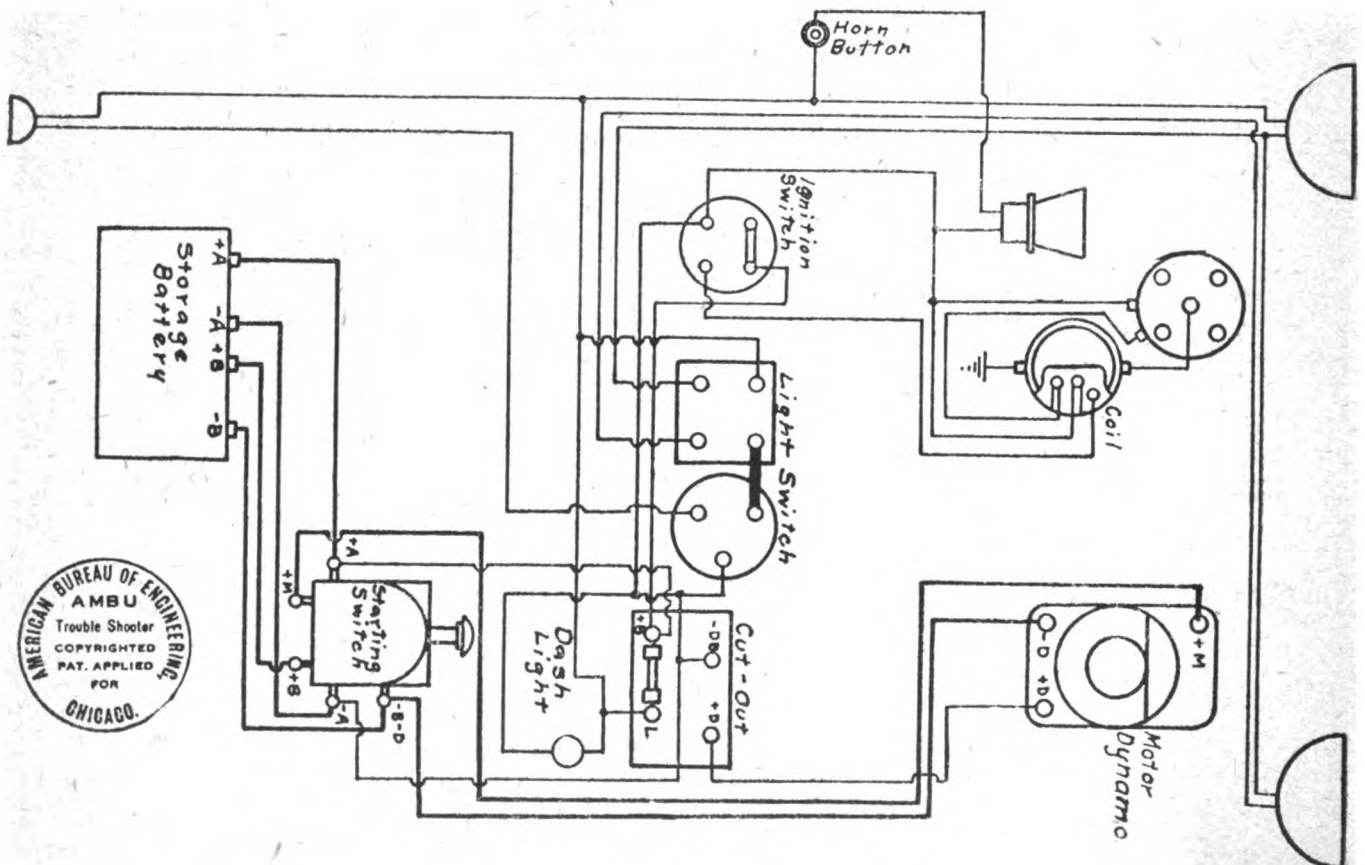
I put in oversize valve stems, reseated and reground the valves, scraped in the bearings, etc.

The water jacket and radiator are clean and the pump works freely. Since I overhauled the engine I have re-adjusted the valves by moving the camshaft gear ahead one tooth but it doesn't show any improvement.

I shall appreciate any help you may be able to give me.

Reply: You should have practically no trouble from overheating with this machine if all of the parts are clean and the fan belt is tight enough to operate the fan.

We are inclined to believe that you have advanced the cam shaft too far ahead and we would advise you to check up on the timing of the engine. The exhaust valve





Differential Adjustment on a Ford Car

From James A. Pierce, New Jersey:—Will you kindly tell me if there is any provision made for the adjustment of the pinion and master gear on the Ford car?

Reply:—No differential adjustment is provided for on the Ford machine. The only way to make the various adjustments necessary to compensate for wear is to insert thin washers between the parts in question.

The pinion gear may be brought nearer to the master gear by inserting a bronze washer of the proper thickness between the gear and the roller bearing in the propeller shaft housing.

The master gear may be adjusted from side to side by inserting the proper thickness of steel or bronze washer between the differential housing and the differential thrust bearing. Be sure to remove the same thickness of washers from the opposite side of the housing or the differential will be squeezed too tightly between the two parts of the axle housing.

Gasket for Ford Cylinder Head

From R. A. Michaelis, Indiana:—Will you please tell me if it is practical for me to use a shellacked paper gasket between the cylinder and head on my Ford engine? I am anxious to set the head down so as to get higher compression. If the paper is not practical how can I increase the compression?

Is it practical to use the same old gasket, I mean the copper-asbestos one, several times, or should I buy a new gasket each time I remove the cylinder head for cleaning?

Reply:—Heavy paper, well filled with shellac, is often used on steam engines and on some of the low speed, marine, gasoline engines of large bore but we doubt if it would last very long on a Ford engine. We feel sure that the gasket would carbonize and the compression and water would leak out after a few hours of running. For this reason we advise against the use of a paper gasket at this point except in the case of an emergency and even then one cannot expect any satisfactory results for the paper might last only a few seconds.

But regardless of the facts mentioned in our last paragraph, it is not advisable to lower the head to get increased compression. The top of the cylinder and the head are so designed that just enough room is left for

valve and piston traverse and should you lower the head, in reference to the block, it is probable that there would not be room for either the pistons or the valves to function properly.

We would advise you not to increase the compression of your engine, for we feel that you would be greatly dissatisfied with results. The engine would knock as soon as the smallest amount of carbon formed in the explosion chamber. But if you decide to act against our advice you can increase the compression by having the lower face of the cylinder block planed off so that the block will drop down more closely to the crank case.

If you are careful in removing the copper-asbestos gasket you may be able to use it several times. Mark the gasket in such a way that you can put it back in exactly the same position as it was before you removed it.

In replacing the gasket give it a thin coating of graphite and oil on both sides. The gasket is made of pliable metal and it should fit itself to both the head and block, under pressure. But in order for the metal to fit itself properly it must be lubricated, hence the coating of graphite and oil. If you have no graphite you may use a heavy cup grease, but the graphite combination is preferable.

Definition of Automobile Terms

From Harry R. Butterworth, Maine:—Will you kindly settle a dispute in which a number of students in our school are involved, pertaining to the nomenclator of the parts of a Ford car? The questions involve the terms of transmission and gear-set. A says that the Ford transmission consists of the magneto and planetary gears and in fact everything which is located in the housing back of the engine. B claims that these parts, except for the magneto, should be termed the gear-set and that the magneto is an entirely separate unit. Which is correct?

Reply:—B is correct as far as the above statement is concerned but the whole matter might be clarified because it is evident that neither A or B fully understand the terms.

In any automobile the mechanical system is divided into two parts the power plant and the transmission. The power plant consists of the engine and all of the units necessary to the engine to produce the power; thus

the magneto, storage battery, generator, ignition, radiating system, etc., are virtually parts of the power plant.

The transmission consists of the units necessary in transferring the power from the power plant to the wheels and under this heading falls the clutch, the gear-set, universal joints, propeller shaft and rear axle including wheels and tires.

The gear-set, or as it is sometimes called, "gear-box" and more correctly called the "change gear set," is but a unit of the transmission system.

The flywheel is often considered as being a part both of the power plant and the gear-set, though it is, technically a part of the power plant.

In the Ford machine the magneto is a part of the power plant in that it furnishes ignition current to keep

the engine going. Since the magneto has absolutely nothing to do with the transmission of power from the engine to the wheels it cannot be considered as a part of the transmission system even though it happens to be located inside the gear-set housing.

The term gear-set is seldom used because the motorist and many repair men refer to this unit as the "transmission." In fact the word "transmission" has come into general use, or we might say mis-use, by many trade papers, our own included, to indicate the gear-set rather than the complete transmission system.

In the same way the word "motor" in reference to the engine is often mis-used for there is really but one motor on an automobile, the electric starting motor.

Special Ford Accessories

Ford Transmission Band Oiler

Of all the Ford accessories which have been brought to our attention during the past few years we feel that the transmission band oiler which is being made by the Haines Mfg. Co. of 90-104 South Ave., Rochester, N. Y., is the most interesting, for it is so different from anything else on the market.

The Ford owner realizes that a large proportion of the chatter and grab in the action of the transmission bands, particularly when the car is first used after a period of inaction, is due to poor lubrication.

Apply the service brake on a down grade and it will overheat in a short time: perhaps burn out entirely; and all because it gets no oil under such conditions. Lubricate the bands properly and their life will be increased and at the same time the chatter and grab is usually eliminated.

The "Crystalites" oiler would seem to solve the problem of band lubrication. It is an oil reservoir which is mounted at the top of the gear-set housing and is designed to catch the oil which is thrown off by the flywheel. The reservoir is provided with three holes from which a constant stream of oil falls to the three transmission bands while the engine is in operation.

We can heartily recommend this particular device as we feel that it will save money and worry for the Ford car owner.

Accurate Timing System and Ignition Lock for Fords

The accurate Timing System and Ignition Lock for Fords which is manufactured by the Safstrom Manufacturing Company, 6706 So. Chicago Avenue, Chicago, Illinois, is a device which, it is claimed, brings the timer away from the oil and dirt up to the level of the cylinder head, thereby making it possible to inspect the inside works while the motor is running, by simply removing the top cover. The cam of this device is made in two parts, and by removing the top half a positive ignition lock is secured. There are many other features of this device which will appeal to the Ford owner and it will pay readers to write to this company and receive full details in regard to it.

Re-Charges Ford Magneto from A. C. Current, without Removing any Parts.

The Magnetizer Manufacturing Co., 146 West Florence Ave., Los Angeles, Cal., manufacturers of automobile accessories and shop equipment, are now marketing a new and highly improved device for re-charging the Ford magneto. With this new device it is said the Ford Field coil can be cleared of all shorts up to the size of a connecting rod cotter pin, and the magneto recharged to full strength, all without removing a single bolt or nut, the device attaches to any A. C. light socket of 110 Volts or more, and will also operate from storage batteries, dry cells, direct current and any farm lighting plant of 24 Volts or more.

The first "Colpin" magneto charger for Ford cars was put in use three years ago and has been put through a long list of tests and the result is, hundreds are in use here in garages, repair shops and authorized Ford agents' shops, and the device is highly recommended by them.

Ford Parts Bin Labels

The Haddon Bin Label Co. of 206 W. Atlantic Ave., Haddon Heights, N. J., is marketing a bin label which should be interesting to every parts dealer.

These bin labels are designed for labeling Ford parts bins and are numbered to conform with the regular Ford parts catalogue. This company also markets other types of bin labels, stock cards, repair tickets and so forth as well as garage bookkeeping systems.

New Pedal Shackle

A shackle which is made of hardened steel (nickel plated), is file and hacksaw proof, and when placed around the three pedals of the Ford car brings the reverse pedal up in line with the clutch and brake pedals, is being manufactured by the Pedal-Shackle Company, 4620 St. Andrews Place, Los Angeles, California.

It can be locked at the end by any make of padlock that a one-quarter inch hardened steel staple which makes it hardened material throughout. The manufacturers claim that it is as near thief-proof as it can be made.

Alcemo Timer Wiring System for Ford Cars

Many Ford owners who complain of "leaky wires" would do well to investigate the Alcemo Timer Wiring System for Ford Cars. This is a direct overhead connected between the coil box and the commutator and it is claimed that it saves forty per cent spark waste, thus delivering to the motor the full intense hot spark. It is claimed that this system saves the spark from "continuous combustion," eliminates carbon trouble, saves oil and gas and prevents "rippling" of the commutator. It can be attached in less than twenty minutes and is enclosed and protected from the oil.

Removing Carbon Scientifically

Carbon has long been one of the main causes of trouble to motorists. Its accumulation is unavoidable and its removal has always been expensive—or a dirty, troublesome job if the car owner did it himself by the old-fashioned "scraping" method.

To meet the steadily increasing demand for something which would remove these trouble-making deposits, over two years were spent in developing Motor-Kleen, a scientific preparation of harmless oils, said to be free from acids, alkalies or ether and guaranteed by the manufacturers not to injure the engine or interfere with lubrication.

Sprayed in through the spark plug vents, Motor-Kleen is said to enter the pores of the carbon, forming a gas by uniting with the oxygen in the air. Upon ignition this gas burns turning the carbon into a powder that is quickly swept out through the exhaust. This powder is stated to be so finely pulverized that it cannot lodge on valve seats or manifold and leaves the combustion chambers perfectly clean.

In addition to removing accumulated carbon deposits, the manufacturer of Motor-Kleen states that by using it every 700 or 1000 miles, motorists will be able to effectually keep their engines free from carbon, assuring full power from every cylinder and lengthening the life of the engine.

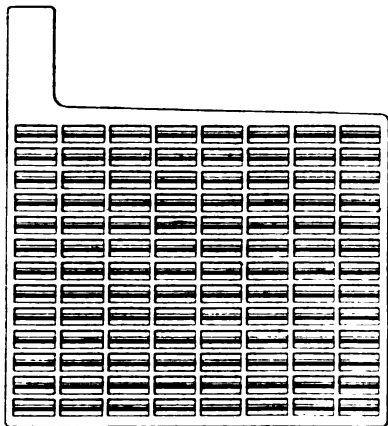
Motor-Kleen is manufactured by the Motor-Kleen Corp., Long Island City, N. Y.

New and Useful Automobile Accessories

The Maclite Storage Battery

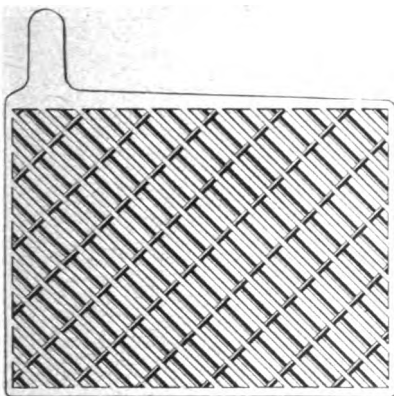
We illustrate herewith two battery grids such as are used in the Maclite storage battery. The feature of this type of grid is its wedge shaped bar construction which is claimed to eliminate much of the "shedding" effect of the active materials.

In these grids the bars are tri-angular in shape with the points of the angles toward



the center. The bars are spaced at intervals, alternately so that the active material is locked into place.

Since the bars are broad and flat at the faces of the plates and pointed at the backs, the active material cannot escape or fall out. Maclite batteries, which are made by the Mac-Lite Storage Battery Co. of Clarendon & Stanhope Sts., Boston, Mass., are built oversize to withstand severe drains of



current and give great capacity; their peculiar grid construction gives them both great strength and long life.

The manufacturers of Maclite batteries back their product with a strong guarantee which insures satisfaction.

Diamond Rubber Calendar

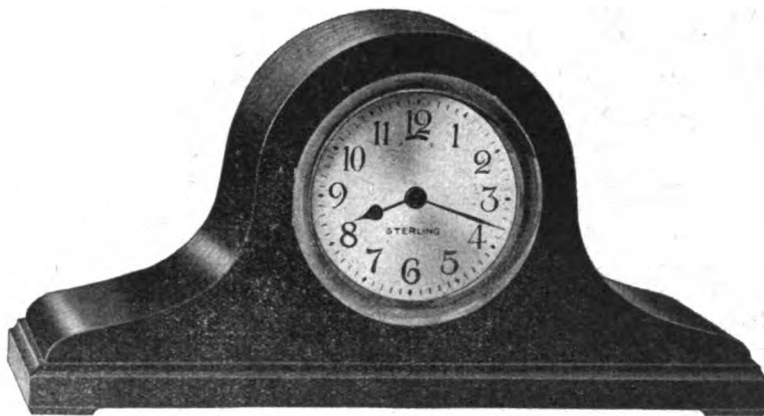
The Diamond Rubber Co. of Akron, Ohio, are distributing a very attractive calendar to the trade. The calendar is designed to cover a period of four months and the original paintings reproduced on it are considered excellent examples of modern art and printing. Our readers are requested to write the above concern for one of these attractive calendars.

An Accurate Time Piece

In our last issue we gave a short description to the Sterling electric clock which is being made by the Sterling Clock Co. of

down," or "run slow" because it is so nearly run down.

This clock is made in many different models and may be operated upon dry cells, storage battery or house lighting cir-



220 East 42nd St., New York City, but at that time we did not fully appreciate the real possibilities and features of this device.

The mechanical construction of the clock precludes any possibility of variance in time. The center pinion which carries the minute

cuits of 110 volts either A. C. or D. C. The clock is mounted for use upon automobiles, airplanes, etc., or may be obtained mounted in a case for the mantel.

The time piece is so accurate that it may be used as a "master clock" to operate other clocks in a garage or service station. We understand that it is now being largely used for this work. The clock will run years on a single set of dry cells and requires but a small fraction of an ampere for operation.



hand and actuates the hour hand is connected directly to a 60 tooth ratchet wheel. Resting against this ratchet wheel is an arm which is connected with a long "curl" or "contraction coil" spring. The movement of the arm is about 1/16 of an inch and its movement carries the minute hand forward just one minute.

The spring, as our readers will realize, will exert practically the same pressure all of the time and even though a variance in pressure should occur the variance would be entirely uniform and the regulator could be set to conform.

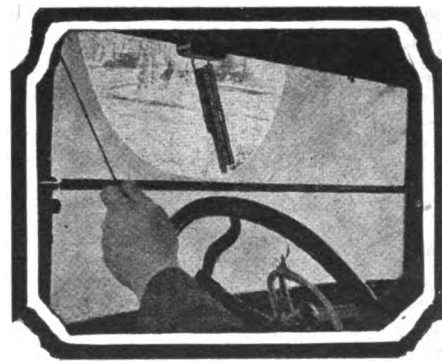
The spring pressure moves the hands forward and the speed is controlled by a system of gears and a balance wheel as in the average clock. At the end of each minute a small electro-magnet is brought into action by the closing of the electric circuit through a set of small contacts and the spring pull is pulled back to its original position.

There are no other springs than those necessary for the operation of the mechanism described so that the clock cannot "run

H. & A. Wind Shield Cleaner

A device which will surely attract the attention of the motoring public is being made by the H. & A. Mfg. Co. of 607 Long Avenue, Cleveland, Ohio. This device is a semi-automatic wind shield cleaner and mist wiper and fastens to the top of the windshield in either open or closed cars.

Mounted on the inside of the car is the box which carries the working parts while the rubber wiping members swing downward on both the inside and outside surfaces of the wind shield.



Connected with the mechanism is a long, leather strap which is carried to the corner of the wind shield and passed through a pulley. The strap hangs down within easy reach of the driver.

In operating the cleaner it is only necessary to give the strap a tug and the wiper arm makes two movements, backward and forward, on the wind shield.

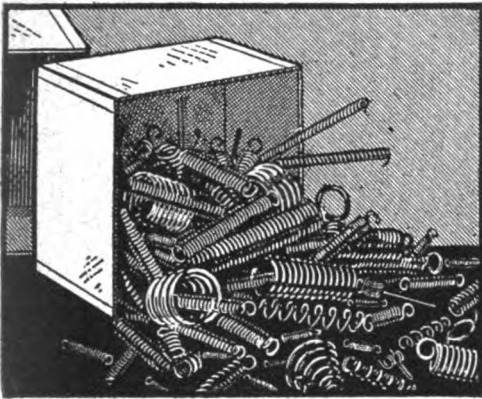
Peck's Assorted Springs

Every garage, repair shop and car owner at times is in need of some kind of a spring. Possibly the oil pump does not give the proper pressure and the car owner is several miles from the nearest repair shop. Under these conditions he must stop the car and go for help or the engine will be damaged.

Frequently a machine is brought into the repair shop for general repairs and the renewal of certain springs is essential for quiet operation.

We would call our readers' attention to the spring assortment which is being sold by The Peck Spring Co. of Plainville, Conn. This assortment consists of just the springs which may be required in automobile work.

In each box there are over 100 steel and brass springs of all shapes and sizes. Springs which fit the carburetor, for oil pumps, brakes, and so on. Extension and compression springs and for taking torsion strains. The average motorist will find



enough springs for simply removing squeaks and rattles to pay for the assortment, while the garage and repair man will make the springs pay for themselves many times over.

Two Useful Tools

From the "1500 Good Tools" catalogue, issued by the Goodell-Pratt Co. of Greenfield, Mass., we have picked two tools as being representative of the line. (Incidentally our readers should all have this catalogue.) We refer in particular to the Goodell-Pratt valve grinder and their inside micrometer set.

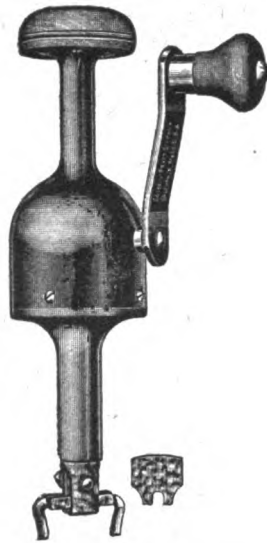
The valve grinder is adaptable to practically any style or type of automobile valve and is designed for speed work. It eliminates the slow, tedious screw driver method and can be used upon valves which could not be reached otherwise.

In using the tool it is only necessary to put it into place and turn the hand crank in one continuous direction. The valve grinding tool travels forward and back, the ideal motion for smooth seating of valves. With the tool are furnished an adjustable, pin spanner with two holes at the top and a regular blade which may be used either for pin holes or for slots.

The inside micrometer set possesses many special features which commends it to any user of measuring tools. This micrometer will make measurements by 1/1000 of an inch from two to six inches. It consists primarily of an accurately calibrated, lead screw micrometer which has a 1/2 inch run and indicates in thousandths of an inch.

A set of four measuring rods are furnished to be used in conjunction with

the micrometer for larger measurements. The correctness of the measuring capacity and the distances between the anvils is insured by the shoulder on each rod which comes to a positive seat against the end of the check nut on the micrometer body.



Each micrometer is furnished with a long handle for use in places which might not be reached by the hand such as inside cylinders etc. Extra rods, when not in use,



are kept inside the handle and are fully protected against corrosion, dirt and damage. The micrometer has a provision for adjustment in case of wear.

The Universal Heater Cut-Out

A device which can be made to do double duty is being made by the Waller Mfg. Co. of Oelwein, Iowa. This device is a combination cut-out and heater valve and is illustrated herewith.

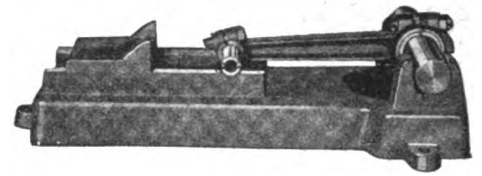
The device is made of high grade iron and is designed to be applied to the ex-



haust line between the engine and muffler. Instead of cutting the exhaust pipe, only a wide slit is made and the cut-out slipped over it.

A butterfly valve, actuated from the seat either through a dash control or through a lever and pulley opens the cut-out or allows the gas to flow to the muffler.

The valve is so arranged that, when open, the gas cannot go to the muffler and when closed cannot escape into the air. The open port of the device is fitted with a set-screw for connecting with a floor heater for use in cold weather.

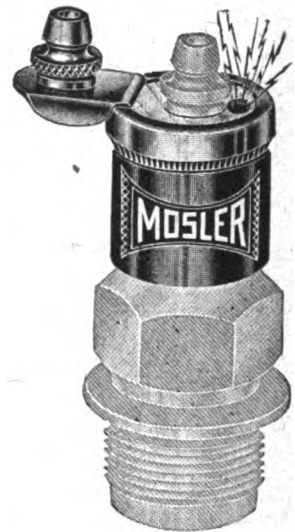


Vesuvius Protector and Intensifier

The A. R. Mosler & Co., of Box 292 Mt. Vernon, New York is marketing a spark plug protector and spark intensifier which has a number of excellent features.

The device is, first of all, a protector for the porcelain and when installed covers the top of the plug to the metal body entirely. It is held in place by the center electrode binding nuts and when in place the circuit is completed by the jumping of the spark from the terminal ring to the ring over the center electrode.

It can be seen that the device is not only a porcelain protector but a spark intensifier as well. An inspection of the



device while the engine is running will indicate whether that particular plug is working or not. The manufacturers claim that the device will usually fire plugs which are broken or shorted and would not fire under normal conditions.

The Reminder Reserve Valve

The Standard Valve Co. of 414 Prospect Avenue, E., Cleveland, Ohio, is making a unique accessory for Buick cars. The device is called the Reminder Reserve Valve and is designed to fit inside the regular Buick tank.

This reserve valve takes the place of the long tube which leads into the tank and can be installed in a few minutes. When in place the dial at the top is turned to the "off" position. This closes a small valve at the bottom end of the tube and the fuel in the tank can only escape to the vacuum system through an outlet in the reserve valve slightly above the bottom of the tank.

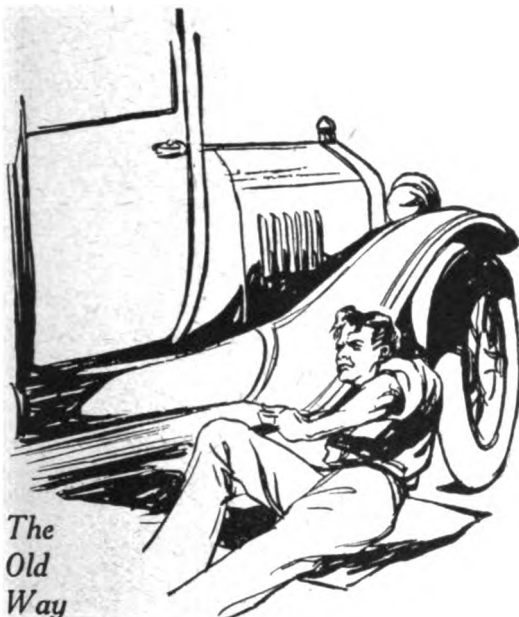
The opening is so arranged that all but five quarts of fuel can be used. When only five quarts remain in the tank the engine will stop and the driver must realize that the fuel is running short. By turning the reserve valve to "on" the remainder of the five quarts can be used, enough to drive the car to the nearest supply station.

No More Crawling Under Your FORD

Oil Adjusted From Driver's Seat

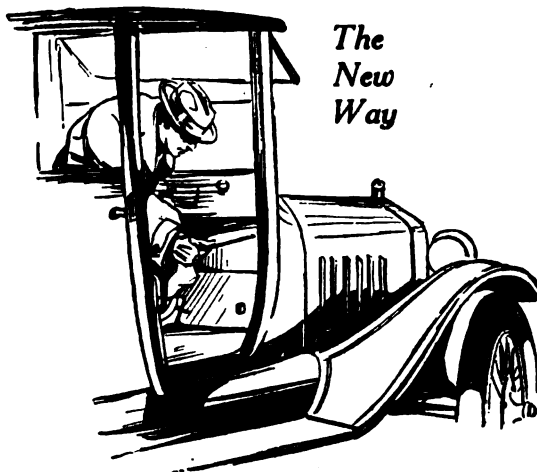
NO DIRT or GREASE

NO TROUBLE



*The
Old
Way*

With
**Schaefer
OIL
WATCH**



*The
New
Way*

ELIMINATE THIS

FOOL-PROOF and HANDY

FORD DEALERS everywhere greet Schaefer Oil Gauge with great enthusiasm. They appreciate its acceptance by the Ford owner as his best assurance against Burned Out Bearings; and as a reducer of expenses, a sure eliminator of trouble and a good preserver of clean clothes. It has many appeals for the Ford owner and these are but a few of the numerous reasons why Schaefer Oil Gauges sell themselves.

ALL OIL TROUBLE ELIMINATED

The Ford owner usually guesses at his oil supply. He just hates to creep under his car with a pair of pliers, twist open the two pet cocks to find out how the oil supply stands. He relies upon guess work and guess work is usually wrong. The result is burnt out bearings and cylinders full of carbon. Show him Schaefer's Oil Gauge which will eliminate all troubles; show him how simple it will be to unscrew the rod from the toe board, lift it up and see at a glance whether his oil is at the

proper level or not. No stepping out of car. No creeping under it. No dirty work and no more oil trouble—the full facts in a few seconds.

EASILY INSTALLED

Installing the Schaefer is so simple that he can do it himself. Simply attach it to the crank case in place of the lower pet cock, bring it up through the toe board and everything is set. No further trouble with oil supplies will be experienced.

ABSOLUTELY ACCURATE

There is no complicated arrangement which can get out of order and mislead him. What is read on the rod is the exact amount of oil in the crank case. The Schaefer Oil Gauge cannot lie because there is absolutely nothing which can get out of order.

DEALERS: You will want to carry Schaefer Oil Gauges in stock so that you will have them when asked for. They retail for only \$2.50. (Write for particulars about our attractive dealer proposition.)

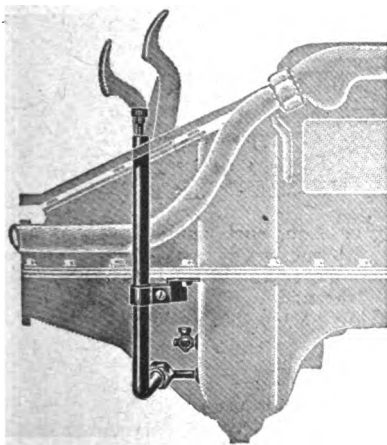
Mail This Coupon Today

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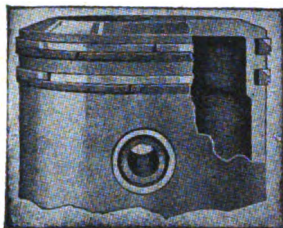
Please send me your dealer proposition:

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Address
Jobber



Kendell Piston Rings

Kendell Piston Rings embody a number of scientific and mechanical features that are arousing interest among the trade. They are of two-piece construction, an inner or expansion ring and an outer or packing ring. It is said that a special analysis iron is used and this further improved through a returning process on the expansion ring, producing what is termed



an "even radius"—type ring. This has a point of expansion every thirty degrees on the entire circle, all points having equal pressure. This is especially beneficial in slightly out-of-round cylinders. A non-clogging oil wiper is also provided on this section of the ring.

The outer or packing section is of softer non-resilient iron, being turned with an inner surface on a 55 degree angle, the expansion ring having an externally inclined face of the same angularity, thereby relieving groove pressure and increasing pressure on the circumference, lengthening the life of the expansion ring. This has also proven to be a non-carbonization feature.

All drawbacks, such as deepening ring grooves, drilling of pistons, oil regulations, springs, pins or other objectional features have been eliminated. The ring is also backed up by the manufacturer with an absolute money-back guarantee. For further details address Department A1 Kendell Engineering Corporation, Fort Wayne, Indiana.

Bridgeport No. 16 Tire Pump

A tire pump which has been referred to as the "hurry-up" model is being made by the Bridgeport Brass Co. of Bridgeport, Conn. The pump is their



model number 16 and is constructed to deliver a great volume of air with each stroke.

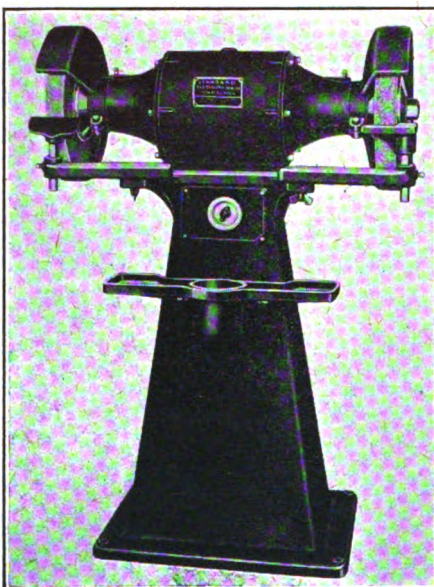
The body of the pump is seamless, made of sheet brass, by a special process of cupping and drawing, rather than from a tube a process which is said to produce a smooth, symmetrical and hard surface. Under these conditions the leather bucket on the plunger will wear much longer than were the barrel irregular and rough.

A special type of bucket expander insures contact with the cylinder walls and a tight plunger fit. The pump barrel is 17 inches long and 1½ inches in diameter and is equipped with a snap connection which saves time in connecting with the tire valve.

Standard Electric Grinder

The illustration shows the new 2 H. P. alternating current grinder now being placed on the market by The Standard Electric Tool Company, Cincinnati, Ohio.

It is made in both the floor and bench type. As the illustration shows, it is fitted with tool tray, water pot, tool rests and



switch within easy reach of the operator. Double-row type high-grade ball bearings are used.

One coarse and one fine wheel are furnished with each tool. The wheels are 12 inches in diameter, with 1½ inch face and 1 inch bore. The wheels are extended 7 inches from body of motor which is said to greatly facilitate the grinding of large and irregular castings or pieces of steel.

The bench type is of the same construction as the floor type with the exception of a suitable base being furnished instead of a pedestal.

These tools are made for either 110, 220 or 440 volt, two or three phase, 60 cycle, alternating current. It is claimed that the very highest grade motor that can be obtained is employed.

All workmanship and material is fully guaranteed.

These tools are of great value in machine shops, factories and any place where heavy or light grinding is to be done. They are far more economical and a great improvement over the old style belt driven types, as all countershafts, belting, etc., are eliminated. Furthermore, they can be easily removed to any part of factory.

For Auto Or Radio Storage Batteries

Car owners or radiophone owners will be interested in the novel and exceedingly simple battery tester being placed on the market by the American Bureau of Engineering, Inc., 2632 Prairie Ave., Chicago. It is a hydrometer, but different from any other we have ever seen. It can be read in semi-darkness.

The new Ambu Battery Tester is only six and one-half inches long, and consists of a bulb, a filling nozzle of rubber



and a glass tube. Inside the tube are three colored balls, red, white and green, made of materials whose specific gravities differ. And that is all; the simplest tester possible.

The inscription on its container tells how to use the device and is clever. This reads:

"Floats all three, battery is charged fully,

Sinks the white, charge still right,

Sinks the green, charge is lean,

Sinks the red, charge is dead."

The user need not know anything about battery gravities when using this tester. White means right, green—lean, red—dead. It is designed so that it can be carried in the tool box, is always handy and weighs only a few ounces.

A New Idea in Piston Ring Construction

Departing from the heretofore common idea of preventing compression leaks by means of a special designed joint and multiplicity of parts in piston ring construction, the engineers of the Leeseberg Machine & Manufacturing Company, of Fostoria, Ohio, have, for the past three years, been devoting their time to the development and perfection of a heat proof piston ring.

Acting on the theory that it is "Heat not Wear" that spoils the ring, they have developed and patented a process of heat treatment whereby a fine grained, gray iron ring is said to be, after completion, absolutely proof against warping or loss of tension due to heat up to a temperature of 700° Fahrenheit.

By exhaustive and scientific tests they have found that the highest temperature reached by even the top rings in a water cooled engine, no matter how severely over-heated, is generally not, and never more than a few degrees, above 400° Fahrenheit. They further demonstrated that



any gray iron, such as is used for piston ring construction, would ordinarily begin to depreciate at temperatures little over 200° Fahrenheit.

Having perfected this heat treating process they decided upon a one piece, step cut, piston ring with machined or quick seating surface and microground sides. By this process any pre-determined degree of wall pressure may be obtained without hardening the outer surface of the ring.

The BEST IDEAS in OIL STATION BUILDING

NOW, the individual or oil company contemplating the building of an Oil Station can secure from ONE SOURCE complete PLANS AND SPECIFICATIONS of a modern, up-to-date station exactly suited to their needs and location, ready to turn over to the builder or contractor—

Also the famous and widely used

American Visible Curb Pump

together with the Oil Equipment and everything needed to complete the station ready for operation.

The plans combine the MOST SCIENTIFIC construction with the BEST and MOST ATTRACTIVE designs, including complete details for economical and efficient arrangement of interior fixtures.

We have issued a booklet illustrating a number of designs and explaining how a THOUSAND COMBINATIONS of buildings, interiors and ground plans can be made from our plans.

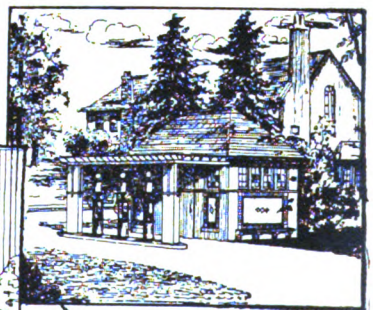
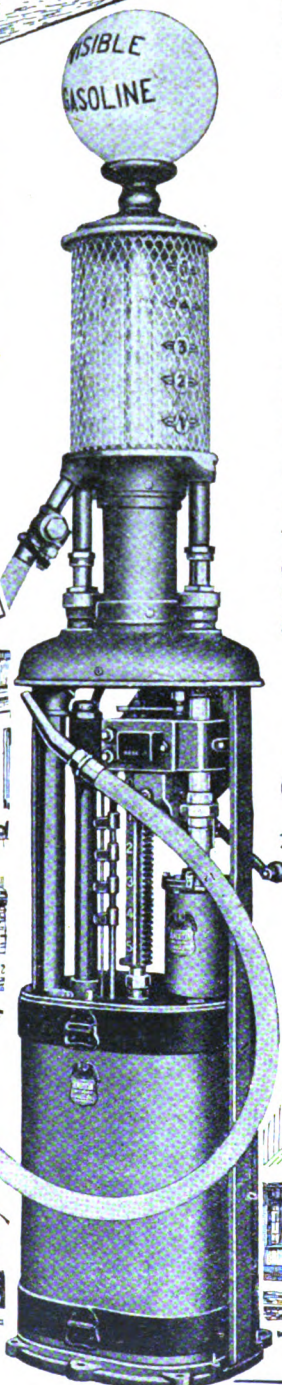
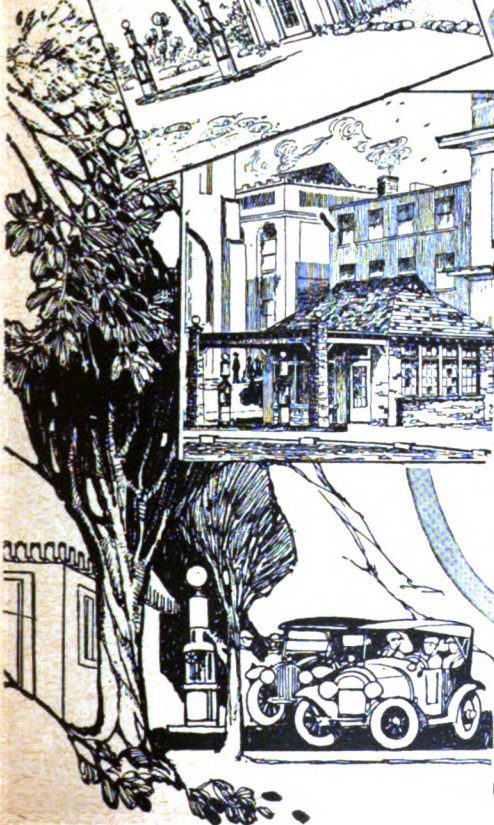
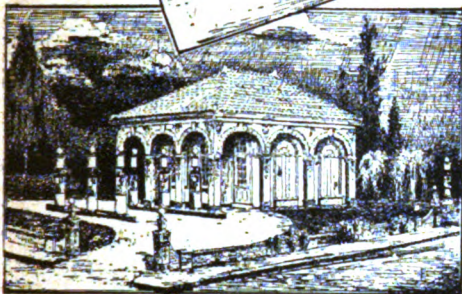
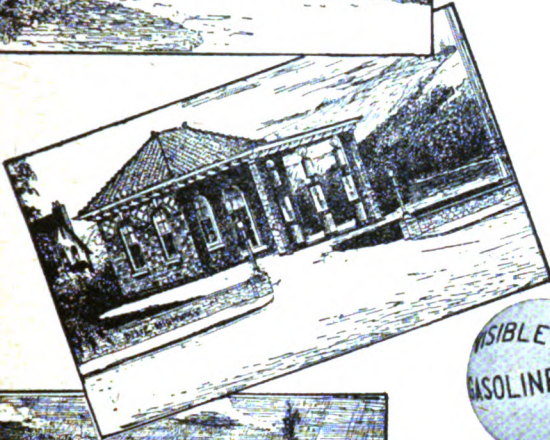
Ask for Booklet 13-D

The American Oil Pump and Tank Company

1143 FINDLAY ST.,

CINCINNATI, OHIO.

IMPORTANT!
Be sure and
specify booklet
by number.



Attention **Mr. REPAIRER**
DEALER



Stops Motors from Pumping Oil—Smoking—Saves 50-75% in Lubricating Oil increasing gas efficiency 15-20%

Few territories open

Do not hesitate

The Auto-Diesel Piston Ring Company

422 Quinpiac Ave.,

New Haven, Conn.

SHOW YOUR CUSTOMERS **SPEE-DEE** THEY'LL BUY

Nothing you can say about Spee-Dee will convince your customers of the wonderful merits of Spee-Dee (like a trial of just one can).
SPEE-DEE is a Smooth, Soft, Creamy Cleanser that cleans Dirt, Grease and Grime from the hands almost instantly without the harsh, irritating action of grit just apply about a teaspoonful full strength, rub in well, rinse with water if handy or simply wipe dry with cloth or waste.
SPEE-DEE not only insures clean hands but is delightful to use having an invigorating effect on the skin that is refreshing.
Every Motorist should have a can of Spee-Dee in the car for use after a roadside tire change or motor adjustment.

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670 W. Austin Ave.

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"PATENTED"

"THE RING IN THE CAR AHEAD"

PISTON RINGS STANDARD OF AMERICA

FOR SEVEN YEARS THE STANDARD
MECHANICALLY CORRECT RING
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*Liberal Selling Agreements open for Responsible,
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Distributors:

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PEERLESS PISTON RING MFG. CO.

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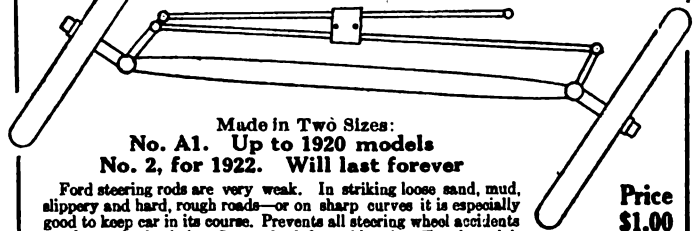
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E. B. F. Steering Wheel Controller

For Ford Cars.

Patent Pending

Clamped on Securely by Two Bolts



Made in Two Sizes:

No. A1. Up to 1920 models

No. 2, for 1922. Will last forever

Ford steering rods are very weak. In striking loose sand, mud, slippery and hard, rough roads—or on sharp curves it is especially good to keep car in its course. Prevents all steering wheel accidents and front wheel twisting. Stops wheels from shimmying. Ten-day trial. Money back if not O. K. If your dealer cannot supply you—write us. Agents wanted.

Price
\$1.00

Address **S. B. PETERSON** Sales Dept.

EAST BRIDGEWATER BRASS FOUNDRY

EAST BRIDGEWATER, MASS.

TIRES AND REPAIRS

(Continued from page 45)

The patch should be firmly held in place for at least a minute before the tube is replaced in the shoe and only enough air put into the tube to slightly round it out, so as to obviate the chances of pinching. After the tire is in place and inflated to its proper pressure let it stand for at least five minutes or the chances are that it will go down again very shortly.

We know that our last statement will bring forth howls of disgust from the makers of the so-called "gasoline patches," but we will stand our ground on this point. If the patch is put into use immediately the internal friction and heat, before it is fully dry, will most certainly crinkle the edges, the talc will work between the patch and the tube and the air will escape.

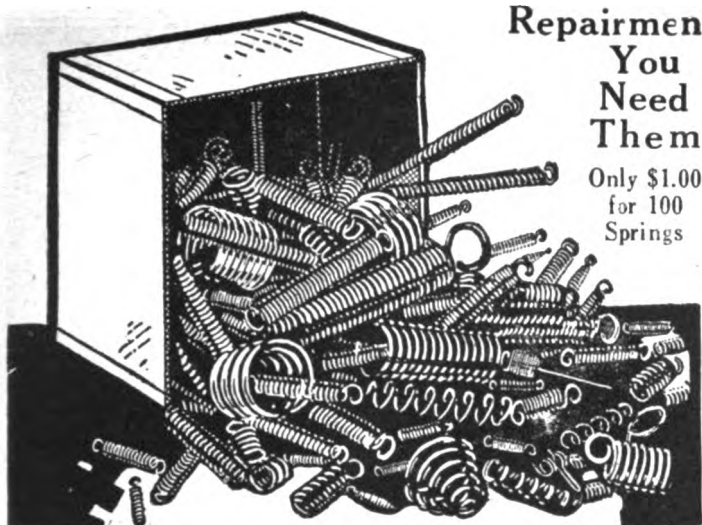
The writer is a firm believer in the "cementless" or gasoline" patch as a quick repair accessory and, as a matter of fact, it is the only kind of patch that he is enthusiastic about. But the writer wants to impress upon his readers that he does not consider such a repair a permanent one.

Fortunately a cementless patch repair can be made into a permanent one without much effort. As soon as you have a chance, and the sooner the better, remove the tube which has been patched and examine the patch carefully. If the edges are flat to the tube, then you have made a good job of it, but if not, then you must fix up the patch or it will soon leak.

Lift up the loose edges and clean them in the same way as you originally cleaned the tube. Use gasoline sparingly and be sure that all of the dust and talc are removed from the surfaces which are to be cemented together.

When a clean surface has been obtained, put the patched tube into a small vulcanizer and give it a five minute cure. The patch should last as long as the tire and if you have not been too lavish with gasoline the tube will not pull away from the patch.

(Continued next month)



**Repairmen
You
Need
Them**

Only \$1.00
for 100
Springs

Peck's Assorted Springs

are indispensable in every garage and repair shop. Every day or so you may need one or more spiral springs on one job. It's worth time and money to have this assortment right where you can pick out what you want.

**THERE ARE DOZENS OF PLACES
WHERE PECK SPRINGS FIT IN**

Brake repairs latch springs, choke valves, cutouts, carburetors, magnetos generators, etc.

This assortment has over 100 brass and steel compression and extension springs in it. Sell four and you pay for the box.

Your own experience will give more "reasons why" you should stock Peck's Assorted Springs.

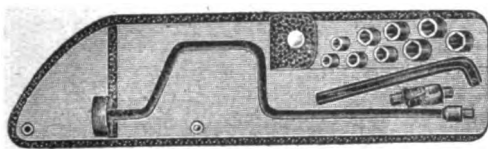
Send a dollar today with your order.

Prices Net to dealer.
\$1.00 per box.
Jobbers Write for
quantity discounts.
Send Your Order Now

THE PECK SPRING CO.
68 Broad St. Plainville, Conn.

Manufacturers of Coil Springs
for every purpose

UNIQUE Socket Wrenches



Style E

List \$7.00

This set is the equal of eight speed wrenches, offset or angle wrenches—all in a neat bag at a price any mechanic can afford to pay.

Ask your jobber or write direct

WILL B. LANE UNIQUE TOOL CO.
422 S. Dearborn St., Chicago, Ill.



The Sign of Service

LET YOUR NEAREST AHLBERG BRANCH BE YOUR STOCK ROOM FOR BALL BEARINGS

We have all types of the highest grade ball and roller bearings in stock ready for immediate delivery.

In addition we have complete stocks of Ahlberg Ground Bearings to be had in exchange for your worn bearings, at a considerable saving.

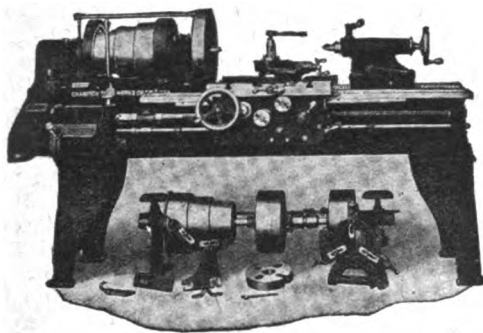
When you next need bearings call at our nearest branch.

BRANCHES:

ATLANTA	BOSTON	BUFFALO	BALTIMORE	SEATTLE	BROOKLYN
CINCINNATI	CLEVELAND	ST. PAUL	COLUMBUS	DALLAS	
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MEMPHIS	MILWAUKEE	MINNEAPOLIS	OMAHA	NEWARK	
NEW ORLEANS	ST. LOUIS	NEW YORK	PORTLAND	OAKLAND	
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Ahlberg Bearing Company
317 E. 29th St., Chicago, Ill.

CHAMPION LATHES



For your garage and equipment work, you must have a lathe that can be depended upon at all times. A machine that is accurate, convenient to operate, and not equipped with unnecessary trimmings. Such a machine we offer in the Champion Lathe at an attractive price.

Made in four sizes 12" to 18" Swing

Catalog gladly sent on request

Champion Tool Works, Cincinnati, Ohio
4950 Spring Grove Ave.

FORD GENERATOR ARMATURES REWOUND \$1.95 net each, any quantity.

Other Types of two unit Generator Armatures \$4.95 net each.
 Write for prices on Motor Generator Armature Winding.

Delivery from 1 to 2 Days.

H. M. FREDERICKS CO., Lock Haven, Pa.

DRIVE 100 TACKS AND SAVE \$25.00

Easy to put on. We furnish instructions. We tailor top coverings for all cars and guarantee them to fit. Ford Roadster, \$5.20; Touring, \$6.95; other cars, \$14 to \$16, with Plate Glass Lights, delivered at your door. Seat covers \$3.10 up. Side Curtains \$5.95 up.

**\$5.20 up
Delivered**

Write for Catalog and Samples

AUTO EQUIPMENT CO., 47 Canal East, Cincinnati, Ohio

KENNEDY AUTO STORAGE COVERS

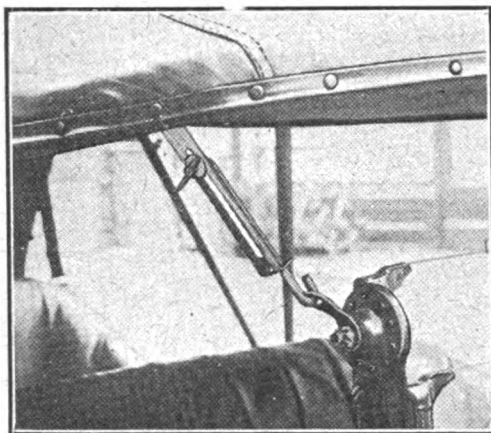
Furnish efficient and economical protection for cars in dead storage. They are made of heavy, durable paper, in standard sizes to fit any cars.

MADE ONLY BY

THE KENNEDY CAR LINER & BAG CO.

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METAL ADJUSTABLE TOP STRAP "FORD HOLD-FAST"

Takes the place of the leather or fabric strap which is part of the original equipment of the Ford car. Easily attached to the car without the use of tools. Adjustable so as to firmly secure the top to the windshield. Stops all top rattles and eliminates the pulling out of shape of the top. Will last the life of the car. Made of steel with a parkerized finish to prevent rusting. **PRICE PER SET, \$1.00.** Being a brand new thing, this is a splendid chance for agents—write quick—don't let the grass grow under your feet. If you are a good worker, you can make a good salary every week.

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NATIONAL AUTO SPECIALTY MFG. CO.

369 East 162nd St.

New York City

The Melting of Brass

(Continued from page 43)

grade the metal it should be done at this time. For instance, all discarded bearings are melted at one time in order to better estimate the nature of the new bearing stock to be cast.

If one is not so particular as to the nature of the metal, globe valves, fittings, etc., are used in the same melting. In the latter event all set screws, hand wheels, etc., should be removed from the brass, that is, all iron and steel should be stripped from the junk metal before packing the pot.

It is important to pack the crucible before starting to melt as it will save time by melting quicker; and will also save lots of discomfort attending a process of introducing the scrap after the furnace is red hot. Pre-packing the pot also tends to prevent oxidization because the scrap is in a more solid mass where the atmosphere cannot reach it.

In Fig. 2 is indicated the loading of a cold crucible. The pieces of scrap metal are placed as closely as possible together in the bottom of the crucible.

Then the fire is kindled inside the brick-work before introducing the loaded crucible. This is done in the usual way, after which a quantity of larger pieces of coke are spread over the fire. These pieces of coke should make a layer several inches deep in the bottom of the furnace.

Egg-size pieces of coke are then scattered in the crevices between the larger chunks. After this the blower is turned on until the coke becomes incandescent all over. Then a few more larger pieces of coke are thrown in to help sustain the weight of the loaded pot. It is next placed nearly in the exact center of the circle.

The space around the crucible is then filled with coke, to well above the top of it. The blower is again put in operation, after which the operator keeps a continual watch over the fire to keep it burning steadily. Fresh coke must be placed around the pot as fast as the other burns and settles; in fact it is often essential to punch

the coke down around the pot because it is absolutely necessary to keep the fire alive on all sides of the pot.

Sometimes it is necessary to pull the pot up several inches a number of times during the melting process, in order to keep a hot fire beneath it. The pot is merely moved up and down enough to cause the coke to work its way beneath it.

The melting depends upon the condition of the fire. In a few words, the fire must be extremely hot on all sides of the crucible as well as beneath it during the entire melting process. This is a disagreeable job sometimes, but if carefully attended the mechanic is assured of success.

Above all he must not get discouraged because the brass does not melt easily, like babbitt or aluminum. He should keep in mind that the inner wall of the furnace is to be white hot before the metal will start to melt. If this is maintained it is only a question of time until the metal succumbs.

When it starts to melt the brass assumes a "cheesy" stage, when it may be crumbled with the poker. Then it gradually settles into a pool in the bottom of the pot. Then its pouring condition is ascertained by dipping a clean iron rod into the bath. If it comes out red hot and without any brass adhering, the metal is ready to pour. But if the molten brass sticks to the rod it is not yet fluid enough to pour.

If more scrap is added during the melting it should be put into the pot as the mass settles. All valves and such other brass castings should be examined to make sure they do not contain water when they are thrown into the heated mass; an explosion is sometimes averted thus. The additional scrap should be pushed beneath the dross that usually collects on the surface of molten scrap. It is an excellent plan to heat the pieces of scrap before putting them into the pot.

When the metal is melted ready for pouring, the worst part of the performance comes. It must be accomplished quickly and deftly, because of the intense heat and because melted brass soon chills and will not run out of the pot then.

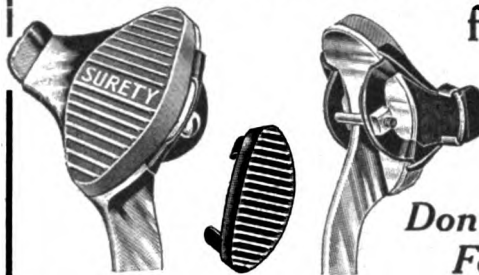
Fig. 3 illustrates one method of taking the pot out of the furnace. Two tongs are employed because there is danger of breaking a piece out of the side of the crucible if but one is used. A red hot crucible if fragile is handled wrongly. Even when using two pair of tongs, the mechanic must be careful to pull straight upward.

But first a section is quickly torn out of the side of the furnace wall. A piece of asbestos paper is thrown on top of the pot to protect the mechanic while handling the pot. Then it is lifted out, set into the pouring shank and taken to the mold, where the dross is scraped or skimmed from the surface of the molten brass. After this the smoking metal is poured into the waiting mold, previously prepared.

The shank or pouring handle may be so constructed that two men may handle it if too heavy for one man.

If excessive smoke comes off during the skimming or pouring process it is a sign that the zinc is being burned out of the mixture. To counteract this, small quantities of zinc may be added; if it is added in sheet form. But

"Surety" Extension Pedal Pads for Fords



\$1.25
per Set

**Don't Let Your
Foot Slip**

Here's a thick molded pad of live, red rubber and heavy, nickel plated steel extension pedal all in one. Widens regular Ford pedals and gives comfortable foot-hold. Screw driver only tool needed. Easiest pad in world to install. No holes to drill. No alterations. Will not work loose. Guaranteed to stay on rigid for life of car.

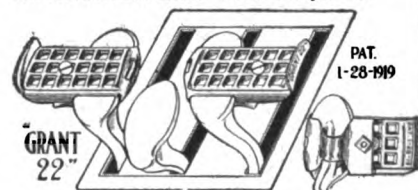
"Surety" pads are dependable. They grip your feet firmly; make driving easy and absolutely safe. You need them. See your dealer at once or order direct from us. They're the greatest value ever offered. Money back if not satisfied.

Sold by all good automobile jobbers and dealers.

"Grant 22"
Made of heavy cold rolled steel, nickel plated. Widens Ford pedals. Give firm, comfortable foothold. Price 50c per set.

DEALERS

Here's a money-maker for you and a great source of satisfaction for your customers. Order from your jobber today or write us direct.

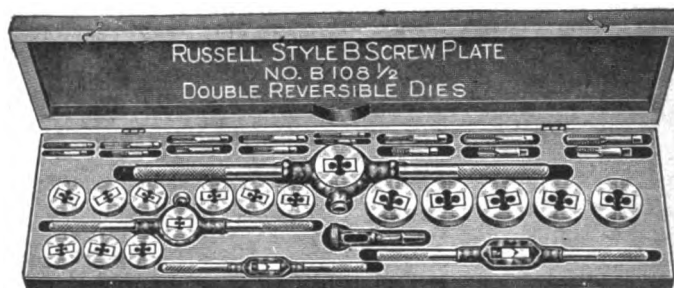


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Originators and Patentees of Extension Pedal Pads for Fords

SCREW PLATE SETS,



For garages and repair shops.

All sizes and styles.

Send for Catalogue.

**Russell Mfg. Co.,
Greenfield, Mass.**

SAVE Five Dollars



Save \$5.00 every time you have the carbon cleaned out of your motor—by using Johnson's Carbon Remover. You can easily do it yourself in five minutes—without even soiling your hands. All you have to do is remove the spark plugs, pour in an ounce of Johnson's Carbon Remover—let your car stand half-an-hour—then start your engine and the carbon is carried out through the exhaust.

JOHNSON'S CARBON REMOVER

is a harmless liquid that contains no acid. It has no action on any metal and does not affect lubrication.

The use of Johnson's Carbon Remover every 500 miles will keep your motor running quietly and full of "pep." And your gasoline consumption will drop 12% to 25%. A half pint (75c.) can will clean a four-cylinder motor twice.

Insist upon your dealer supplying you with Johnson's Carbon Remover. There is no substitute.

Mail the attached coupon for our book, which tells how to reduce automobile depreciation with Johnson's Car Savers.

Representatives wanted everywhere to sell Johnson's Car Savers to stores and consumers. Preference given to men with cars. Write for our proposition—it's a dandy.

S. C. JOHNSON & SON, Dep AD6, Racine, Wis.

Please send me free your book on "Keeping Cars Young."

Name

Address

Dealer's Name

too much at one time will chill the mass so it will not run into the mold.

In Fig. 4 is shown a modern type of oil burning brass furnace and a pair of special tongs for handling the hot crucible. This outfit is comparatively inexpensive where a considerable amount of brass is to be melted regularly. Besides being a great deal safer it also makes a cleaner brand of metal if properly manipulated.

For the average garage or blacksmith shop where the melting would be done only at infrequent intervals the process described above is probably the cheapest that can be devised and still be dependable.

Case Hardening

(Continued from page 46)

charred hoofs or a mixture of charred hoofs and charred horns. If he neglects to make the change, then he may expect to have the skin of high-carbon steel very brittle after the article has been heated and quenched.

Standard Case-Hardening

The foregoing processes given in considerable detail refer principally to the production of thin, very thin, skins of hardened high-carbon steel. It will often be desirable to have a thicker skin. Further, it is very desirable in many cases—perhaps most cases—to have the hard skin well supported by the interior metal. This requires explanation.

Suppose, for example, that a piece of steel containing only 0.20 per cent of carbon is so impregnated that there is a skin or shell $\frac{3}{64}$ inch thick which is now a high-carbon steel containing, say, 1.50 per cent of carbon. We will assume that the 1.50 steel stops with the $\frac{3}{64}$ of an inch and that all the metal inside is still a 0.20 steel.

If things turned out this way, the result would not be the best, probably, for many users. The transition from the very hard high-carbon steel to the soft low-carbon steel is too abrupt. The reader must remember that where the whole article is heated and quenched, the outside skin is all that will really harden. The interior 0.20 per cent steel will not be given any especial additional hardness. The result of heating and quenching will produce then a very hard and probably very brittle outside skin and a soft interior.

This soft interior is not the best support imaginable for the hard and brittle skin. Rough treatment may break the outside clear from the soft part or the outside skin may yield under exterior pressure because it is supported by such a soft foundation.

What would tend to remedy this undesirable condition is a shading off from the very high-carbon steel to the very low-carbon steel variety. That is to say, it would be well if the outside 1.50 steel should have next to it a 1.25 steel and this a 1.00 steel and so on. The shading might not go by big steps but by little ones. In short, the case-hardening should produce a deep impregnation shading off from the excessively high-carbon skin.

(Continued next month)

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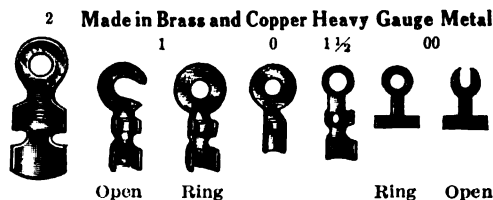


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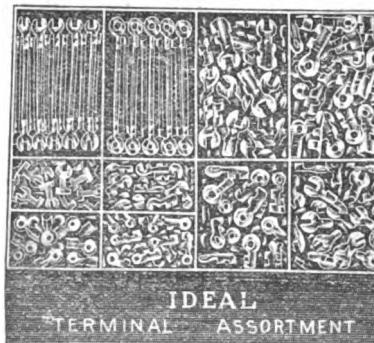
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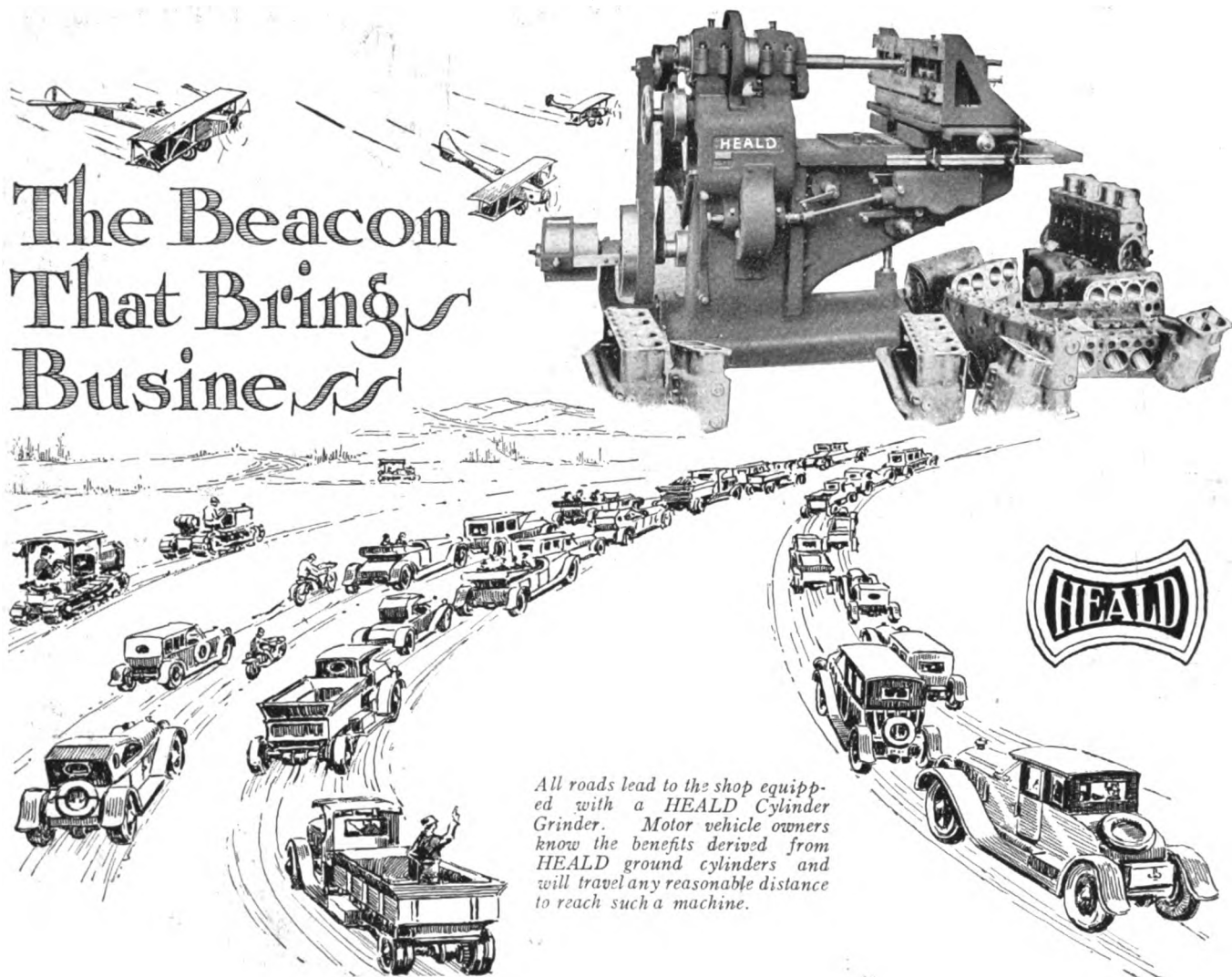
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The Rhyme of a Troubled Poet



Fair Summer's here, the flowers are blooming
And bees are round the blossoms zooming.
I hear the robins sweetly chipping,
(I think that darned old engine's skipping.)

The air is sweet, the breezes calm,
The open country hath its charm.
I love the fresh smell of the grass.
(I guess there's water in the gas.)

I sit beside the babbling brook,
Contented with my pipe and book.
The minnows in the water prank.
(I'll bet I didn't fill that tank.)

A blue jay flits into a tree,
And starts to scold a chick-a-dee,
He surely is an imitator.
(I'd better clean my carburetor.)

The thrush tunes up a song so sweet:
A squirrel jumps across my feet;
A cricket chirps with much ambition.
(It may be due to poor ignition.)

I hear the lowing of the kine,
And up above, the leaves entwine.
The fleecy clouds ride overhead.
(I'll bet a cent the spark plug's dead.)

One can't sit here and still be sad,
For everything is bright and glad,
All Nature smiles beneath the sun,
(I wish that darned old car would run.)

But Gosh! I can't a poet be,
With that old flivver botherin' me.
How can a fellow write good verse,
Who owns a car that needs a nurse?

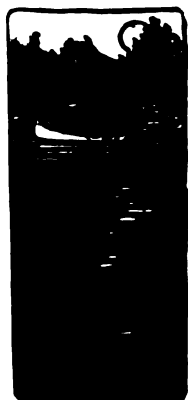
I might as well stop writing rhyme,
And put that engine into time.
But first, before I fix the pest,

Ho-Hum

I-guess

I'll take

a-rest.



Health Hints for Welders

If You Welders Value Your
Health Read the Following

By David Baxter



AS a whole the oxy-acetylene torch welders trade is not an unwholesome occupation nor an unhealthy one. Nor is it particularly objectionable even in isolated instances where it is not possible to employ every precaution that tends to promote the operator's welfare. But then you will find men who will take a chance in spite of anything that can be done to eliminate danger or sickness.

One of the main elements which the welder uses is the oxygen. It is not unhealthy, even though it escapes into the welding room in large quantities. The welder may breathe it without fear of injuring his health. In fact it should be just the opposite; very healthy, since it is present in nearly everything on earth, constituting nearly eight-ninths of all the water on the globe and more than one-fifth of the air. It is found in the tissues and fluids of all forms of animal and vegetable life.

So there should be no reason for it to be unhealthy in a free state.

Acetylene Gas Not Particularly Injurious

Nor is the acetylene gas particularly injurious to humanity, and when combined with oxygen it is no worse.

However, the two elements that go to make up the welding flame, in combination help to create conditions that

are not always favorable to the torch operator. Many of these conditions may be minimized if not entirely eliminated. That is the welder can take steps to prevent the conditions from becoming unhealthy or unsafe.

Take the matter of injury to the eyesight. Here is one item which is a factor almost absolutely under entire control of the torch operators. The welding flame is detrimental in two ways. First by the blinding intensity of it and secondly through slow strain by continued gazing at the flame.

Colored Goggles Essential

No welder can afford to take a chance by welding without using colored goggles to prevent the glare of light from weakening his eyes. Even if the job is a short one his eyes will be affected to some extent, especially if a large torch is employed, and if he makes a practice of doing several short jobs every day he will soon begin to note the bad results of such foolish methods.

The continued strain will eventually weaken the eyes even if the glare could do no harm. This is on account of the strain set up through concentrating efforts to tell when the metal is not melting properly.

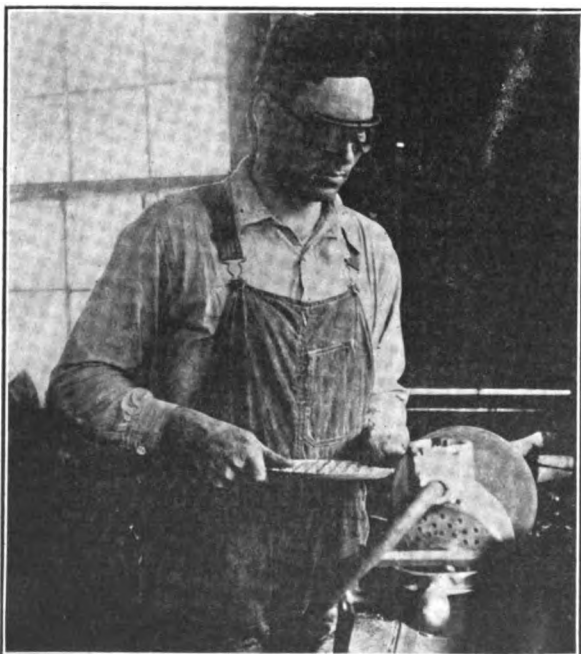
Both of these dangers are minimized, if not actually eliminated by the use of proper goggles.

It should then be an unalterable rule for the oxy-acetylene welder to always wear colored goggles whenever he is employing the welding flame for any purpose. That is not all: to get the most good out of the rule, the goggles should be worn according to the intensity of the flame. That is, the welder should not wear one pair of goggles for all classes of welding, although that is the very thing many welders do, thinking they do not have time to fool with more than one pair.

Three Types of Goggles

The scientific operator has at least three pairs each of different density. A deep pair for the large flame on heavy welding; a light colored pair for the smallest flame; and one in between for the average welding job. In this way he prevents the continued peering through dark glasses in an effort to see how a small weld is progressing. In the same way by selecting the proper lenses he reduces the danger of eye injury caused by welding heavy jobs while wearing light colored glasses. In short the goggles ought to fit the job just as much as the flame and filler are selected according to the weight and size of the work.

The office of welding goggles is not entirely to prevent eye strain, however. It is also to protect the eyes from



Always wear clear glass goggles when grinding on an emery wheel

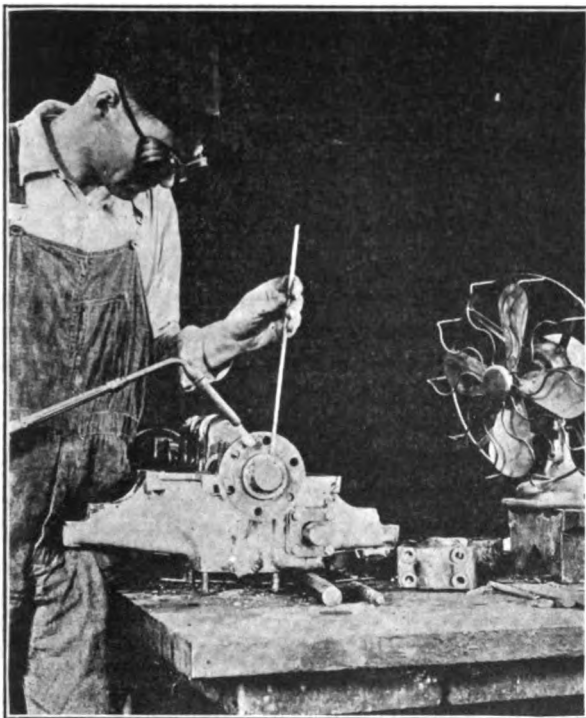
flying particles of metal, slag, or other hot substances. These can be proved by an examination of any pair of goggles that have been in use for some time; the lenses will be absolutely covered with tiny pits or clinging bits of metallic matter.

This brings out another important point: the best, because the most economical, kind of goggles is the kind having two sets of glasses. An outer set of clear colorless glass, which protects the inner or colored glass from the flying particles. These goggles are made so the outer lenses may be readily changed at any time, thus saving the expense of throwing the colored lenses away. A supply of clear glasses should always be kept on hand because they sometimes become blurred by the tiny pits in a remarkably short time.

Celluloid Goggles Should Not Be Used

Goggles of celluloid or composition should not be worn at any time while welding on account of the danger of taking fire. In this event the operator would undoubtedly lose his eyesight before he could remove the goggles.

Now even were there no bad effects, to the sight, of wearing no goggles while welding, the feeling of safety alone would more than repay the operator. This brings out the fact that the goggles should not only have lenses



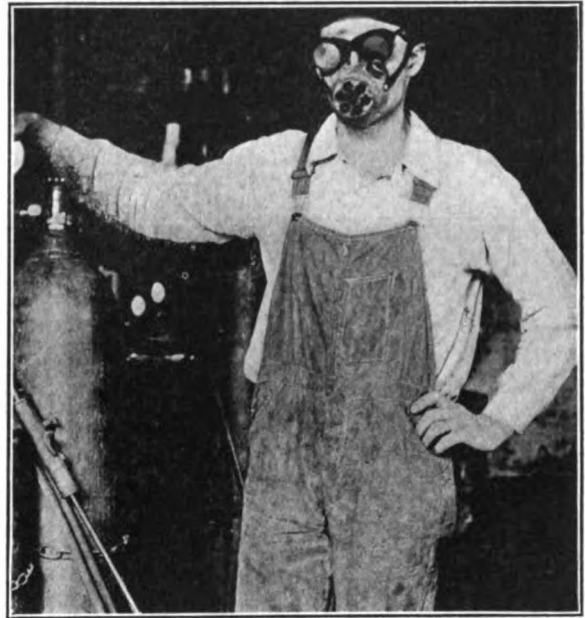
An electric fan is useful in blowing the fumes of a brazing job away from the welder.

of the proper density but they should be comfortable otherwise. Ill-fitting goggles or those with metal frames often lower the welder's efficiency to a marked degree. The metal frames get hot and irritate the operator. Poor fitting goggles are a discomfort which cause him involuntarily to do a poorer grade of welding.

Before leaving the subject of goggles and eye protection it may be well to caution the welder about grinding steel, iron, aluminum or other substances. He should

always wear some sort of eye shields when engaged in this kind of work. Fine particles of emery dust or bits of slag when thrown by the high-speed wheel are always very painful if not very dangerous. In fact emery dust alone when thrown into the eye will often cause severe inflammation and cause the victim to lose a few days' time, besides suffering and doctor expense.

However, for grinding purposes a simpler and cheaper kind of goggle may be used; such as is shown in one of the pictures accompanying this text. These grinding



A respirator is a useful device when welding heavy brass jobs.

goggles should have clear glass of good quality, especially where accurate grinding is essential.

After the welder's eyesight, his lungs are probably the most vulnerable point of attack by ill health, inasmuch as the lungs are the center of vitality. As the welder is forced to breathe heated and fume-polluted air a good part of the time he should do everything possible to avert the trouble.

When welding brass or other copper alloys the risks are increased and extra precautions are needed. The fumes arising from melting metals of this class are sometimes extremely injurious.

"Brass Chills"

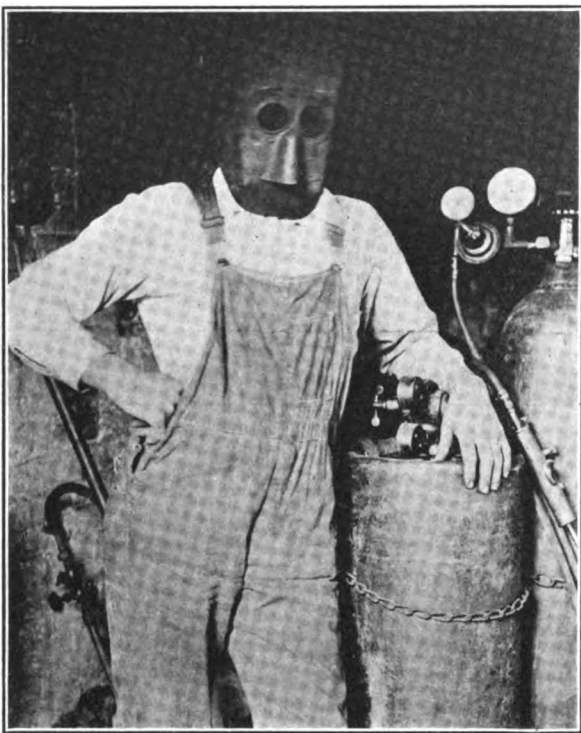
Lead poisoning and "brass chills" are quite common in shops where lots of alloy welding is done. The victim often suffers several days from a single attack. Probably the worst feature of it is that he cannot tell when he has inhaled the poison until he has commenced to feel the symptoms, often several hours afterwards. Then his head will be racked with pain and every bone and joint in his body will ache. Sometimes nausea and vomiting will occur.

Probably the most effective method of preventing brass poisoning is to install a suction fan over the welding table in such a way that it will draw the smoke and fumes away from the weld before they can reach the welder. This exhaust should carry the fumes out of doors.

Another method of combating the brass chills is to arrange a common electric fan so it will blow the fumes away from the torch operator, as is indicated in one of the pictures. This electric fan is also useful as a health hint in another way: when welding a long, hot job the fan is placed so the breeze will blow directly upon the operator, making the heat more bearable and thereby increasing his efficiency at the same time.

Care should be taken, however, that the wind does not strike the welded casting, as a current of cold air will oftentimes cause the weld to crack through the unequal contraction thus set up.

A remedy employed in brass foundries and welding shops where much brass work is done, for the purpose of counteracting the effects of lead, zinc, or brass poisoning is to drink large quantities of fresh milk; as a preventative



Not a Klu Klux; merely an electric welder's mask; very useful for a torch operator on a hot job

it should be drunk before starting to weld: as a remedy it should be taken after the first symptoms shows. As much as a quart is needed in severe cases. Brass molders often drink that much with their lunch as a preventive.

The fumes of the burning metal are inhaled to lodge in the mouth and throat, from where they are carried to the stomach. Then the milk counteracts the poison of the metal and thus keeps it from being carried to the whole system, to cause the head ache and ague.

Another device for eliminating the poisonous fumes of melting brass is what is termed a respirator. This is worn over the mouth and nostrils to prevent this oxidized metal from reaching the mouth and throat of the victim. Such an apparatus is shown in one of the accompanying illustrations and consists of a rubber cup containing a moist sponge to catch the atoms of oxide and prevent them from being drawn down the wearer's throat. An

ingeniously contrived valve is inserted between the sponge and mouth piece to facilitate free breathing.

A device like this is peculiarly adapted to close quarters or in places where no other precautions may be employed.

Now, since heat is one of the worst enemies with which the torch operator has to contend, the electric welders mask shown in one of the cuts is often very effectively employed by the torch welder as well. This device, which is in reality a black paper helmet, effectually protects the torch welder from radiated heat of the job and intense glare of the welding, in so far as his face and eyes are concerned. The large eye holes are provided with colored glasses to serve in lieu of goggles which are not needed when the mask is worn.

The rays of light from an electric arc weld are harmful to anyone not protected by a mask of this kind. In fact a slight exposure of the skin to the electric rays results in a burn quite similar to the well known sun burn even though the person is standing as far as fifty feet away from the welder. It is said the rays will even pass through thin clothing to cause a bad burn if long continued. As a result of the electric burn the skin will all peel off as it heals.

Mask Shields From Heat

However, the mask is not worn by gas welders for the purpose of protecting them from burns of this nature but to shield them from the intense radiated heat of a heavy welding job, especially where lack of room keeps them from utilizing other means of protection. The mask also serves to protect the welder's face from explosions of flying sparks or oxide while working in cramped quarters.

It might be well to add that the torch operator who works steadily every day at the welding trade should further guard his health and eyesight with plenty of sleep. Nothing will counteract the evils of overworked eyes more than sleep. Where the eyes are straining all day, through closely watching the melting white metal they should be given the opportunity to recuperate by sleep at least eight hours every night. The effects of watching the welding flame and molten metal day after day may not be apparent at first but the ultimate result is weakened vision.

Perhaps it might also be well to reiterate some of the cautionary measures needed in brass welding. Where the welder cannot see the fumes he is liable to think they are not present. This leads him to take a chance and breathe some of the poison. Then, if his system happens to be able to throw it off without trouble he will take a longer chance next time.

Perhaps the warnings given here are a little overdrawn but if so it is for the purpose of causing the welder to be careful. It must not be thought that every little job of brazing is dangerous, although the direct fumes from any alloy job are laden with poison and should not be inhaled.

Now the foregoing are just a few of the main health hints for the welder but they should disclose the fact that

the torch operator must guard his body in order to attain the highest efficiency.

It may seem to take a little more time or a little more

labor sometimes but the welder will be convinced it is money well spent after he has had a siege of the miserable brass chills once.

Car Owners I Have Met

A Discussion of the Subject From a Different Angle



LAST month I had the pleasure of venting some of my anguish against garagemen whom I had met and said some fairly harsh things. Since I'm still alive and in full possession of all my faculties, I'm tempting fate this month by waking up the dormant antagonism of those who have bitten and been bitten—I speak of the car owners. So, if you are a car owner, be prepared, for what I am about to remark is strong enough to sizzle the hair from an asbestos wig.

Some people are prone to look upon certain types of victims as "suckers"; once you bite at a tempting bait, and get hooked, all your friends will whisper behind your back, smile behind their hands, and whisper "sucker" to themselves. But is it humane to make such a comparison, is it fair to the poor fish who swims in the pond or brook, living only to eat and eating only to live?

The greedy sucker in the brook, who bites upon a bent pin hook, is not so foolish as he seems, he thinks he's eating "pork and beans." He bites to satisfy his throat and not to see inside your boat. But when a man snaps at a bait, it shows a lapse of mental state. A man bites just because he's greedy and not because his stomach's needy. You don't waste grief upon the sucker, then why shed tears upon the other?

The more times I read over the above paragraph the more I am impressed with the similarity between the cases. However, most of us will continue to shed tears over the poor nut who has just recounted his tale of woe and tells how badly he has been mulched by some knight of the monkey wrench. But our tears are shed from mirth and not from sorrow.

A "Poor Fish"

We call the fellow who has been mulcted a "poor fish" and a "sucker" mostly because it is his own fault. The average car owner howls at the repair man and the garageman and tells his friends that all are thieves and robbers lying in wait for innocent victims. I can say without prejudice that the repair and garagemen would be a crowd of winged angels if the car owners only used a moderate degree of human intelligence in dealing with them. A yellow tailed wasp cannot sting you unless he sits down and if you don't let him sit down on you he will hunt around for more passive game.

There are plenty of excellent repair men in the country and yet these same men, honest to the core, are daily

brought into contact with car owners who do their level best to make repair men dishonest. And now I will relate some of my observations which I made at the same time as those relating to the "Garage Men Whom I Have Met." And this article relates to those car owners whom I have seen done to a nice golden brown, some of them have been burned.

Among my acquaintances is a man who owns a King car and who feels that of all the cars in the world his is King. There may be other cars like it, but not on the same level. His King car is too good to be placed in the same garage with even other Kings and as for allowing it to associate with Fords! Huh! He wouldn't even allow his car to bump a Ford from the rear.

"A "Light, Gentlemanly Knock"

But even Kings have their faults and my friend's engine had a knock, not a crude, every-day, common knock like other cars have, but a light gentlemanly knock and it bothered the owner. So he came to me and asked for a diagnosis.

I puttered around long enough to make sure that the valves, two of them, had too much of a clearance and gave my humble verdict. I might say at this point that I utterly and absolutely refuse to do repair work, on principle, because once I started this game I would not have any time to myself and my own car keeps me busy when I'm not weeding the garden or mowing the lawn or painting the house or chasing dogs from the flower bed. But I'm always willing to listen to a friend's tale of woe and try to give him good advice.

But the King car owner was not satisfied because he knew his car was not of the common herd. He felt pretty sure that his car had a deeper trouble, he didn't know anything about machinery but had been reading all of the motoring columns in the daily papers and wanted me to say that the knock was caused by loose piston rings.

So with this idea in mind he took his machine to a reliable garage man. The repair man said exactly what I had said, "valve tap." The King owner was peeved and riled and told that repair man what he thought of amateurs and took his car elsewhere. Finally he found a man who agreed with him and so he gave that man the job of pulling down a perfectly good engine and putting in new rings, new pistons, new wrist pins and so on. He paid over \$75 for having two valves adjusted. I happen to know that that repair man did nothing else. If the owner had asked for an itemized bill this is what he

would have received had the bill been truthfully rendered:

To adjusting two valves	.50
To satisfaction (sucker bait)	\$74.50

And, knowing all of the circumstances, brother reader, wouldn't you have done the same as this garage man? If a sucker flops into your boat while you are fishing you wouldn't throw him out, now, would you?

Don't try to "kid" your repair man into thinking that you know all about automobiles if you are ignorant; keep your mouth shut and your eyes open. Any ignoramus can act wise and no one will know the difference if he doesn't talk too much. I was in a garage not long ago when a man brought in his car for repairs. The brake bands looked like the frayed ends to a storm whipped flag of truce. The owner of the car talked large and loud on every subject from radiation to tire inflation and made a perfect fool of himself, if perfection along this line is possible.

Twenty Dollars vs. Two-Fifty

Those frayed ends bothered him, something was wrong and he wanted the frayed ends removed. The garageman suggested new linings and quoted \$20 as being a fair price for repairs. "Woof" said the owner, "robber." And several other things. Finally he talked the repair man into a \$2.50 job. I hung around long enough to see the repair man take off both wheels, trim off the ravelings with tin shears and give the linings the "once over" with kerosene and the "finished" ticket tied to the car. Since then I've watched the "Death" columns for I feel that sometime that misguided owner will get his name in the paper.

I have a friend who pays \$2.50 a week to have his car greased. Vainly have I reasoned with him that a weekly greasing is wholly unnecessary and I know that his garageman is smiling to himself, but it does no good. But if the garageman were to protest; if he were to refuse to fill a grease cup which is already full to stewing over, he would lose a part of his income and the car would go elsewhere. I wouldn't blame the garageman for "greasing 'em up" every day, if one of my customers was pleased thereby, if I were a garageman. My motto would be, "The customer is always right."

Believe It Or Not!

One garageman who I know told me a yarn which seems almost incredible, yet I have since found it to be too true. One of his customers owns two sets of spark plugs upon which he pays rental. About four times a year he drives into the garage and asks for a set of plugs. The car may be running like a clock, but that matters not, new plugs must be installed. So the garageman takes out the old ones, puts in the ones which had previously been in the car and the man drives off happy. The garageman takes the old plugs, buffs them up on the wheel, cleans them thoroughly and keeps them until the customer comes back again for more. He gets \$1 apiece for these reno-

vated plugs. But he is strictly honest, he saves the plugs for the car from which they were originally removed.

Which leads me to ask why a sucker filled with bait must bite upon a hook? But they often do!

I know of one sucker who baited his own hook and then took a big juicy mouthful, only to be hauled in immediately. His car was running fairly well, as well as could be expected, but he was one of the kind whom nothing satisfies and wanted to get 60 horsepower from a 40 horsepower engine. He had convinced himself that new rings always help, whether the rings are needed or not. And so he took his car to a repair shop and asked the man in charge to fit a set of new rings of a certain kind.

New Rings?

Naturally the repair man assumed that the owner knew what he wanted so he pulled the engine down and removed the pistons. One glance at the rings was enough, no man living could have put in a new set of rings, of the same kind (for they were of the type the man wanted) and made a better fit than the old ones. So the repair man gave each ring a half turn and put back the pistons. He cleaned out the carbon and ground the valves and the owner was absolutely satisfied. But the repair man charged for his work—and why shouldn't he?

There is a whale of a pile of this kind of work done and only the owners are to blame. If you sell hats and a man comes in for a new derby you don't look at the old derby and tell the man that he don't need one. If you're a dry-goods man and a lady asks for 60 yards of cloth for a dress you don't tell her that you won't sell her that much because six yards will be enough. And so it is with the repair man, don't blame him for doing what you tell him to do.

Ask the Repairman's Advice

Ask the repair man what he thinks before you do too much talking and you'll save money. A story was told me recently of a man who knew more than his repairman and did the talking instead of the asking. Though I won't vouch for the truth of this story I am willing to believe it for stranger things have happened.

Joseph had been a fairish machinist for nearly six months, that being the time he had owned his Ford car, when he noticed a peculiar groaning noise while the car was running. At times the noise was loud, at times weak, but mostly it was evident and bothered Joseph. He studied the matter deeply and finally came to a logical conclusion. He ordered his repair man to put in a new set of timing gears. This was done but the groaning was still with him.

Groaning must come from gears, thought Joseph so he decided that the transmission must be at fault. A second trip to the garage, another curt order to the repair man and the Ford was blessed with several new transmission gears. But the groaning still continued.

By this time Joseph himself was rather sick, his pocket book was squealing and the Ford car sounded like a sick

calf, so Joseph did the only thing left to do, had the rear axle overhauled. And then the groaning was louder than ever and Joseph did what he should have done in the first place, called for advice from a man who knew. The repair man didn't even hesitate when asked about the noise, but crawled beneath the car with a wrench, tightened the body bolts and the groaning was silenced for good.

One of the most common baits for catching suckers that I know about is the "carburetor bait." A man is fully satisfied with his car until he hears several of his friends talking about their machines. In the good old days behind the village store stove the old codgers used to tell stories of the fish they had caught. A ten pound minnow or a 36 inch trout were entirely normal and no one ever questioned the yarns. To-day the stories are just as large but they deal with automobiles, not fish, and they are told on the smoker of the 5.15.

Fish Stories

It is no uncommon thing for a man to get anywhere from 40 to 60 miles on a gallon of fuel; in fact I know of some owners who can drive all day on nothing but a smell or the car's reputation. And so it is no wonder that the new car owner worries about the paltry 20 miles to a gallon which he is getting from his car. He goes to the nearest accessory sales room and tells his troubles. But, poor fish, his troubles has just commenced. He buys a new carburetor and once he has done this his fate is sealed.

If the new carburetor gives low mileage per gallon the owner is dissatisfied, feels that he has been swindled and buys another. If, on the other hand the carburetor gives more mileage than the old one he is pleased for a while until he reads or hears of another marvelous mixer which goes indefinitely upon one priming and then he buys that. Sometime, somewhere, a brilliant genius will start a carburetor exchange and make a fortune. He could make a service charge for each exchange and I'll bet he could keep his stock of carburetors moving so fast that they would burst into spontaneous combustion.

What Makes the Wheels Go 'Round?

I could write all day about motorists whom I have seen nibbling at the bait and who have eventually been caught but space is limited. I think I have said enough to illustrate my point that no one but the sucker is to blame for biting.

In these days of modern education there is no excuse for the automobile owner who does not know his own car. Hundreds of books are published which tell enough to enable the owner to know what makes the wheels go, and it is up to the car owner to read some of them.

(Author's Note. I fully realize that some of my metaphors are a bit mixed. A sucker seldom bites at a fish hook, no matter how cleverly it is baited, but my readers must take my words figuratively, and not literally and credit me with some fish knowledge. The seeming lack of logic can be charged up to writer's license.)

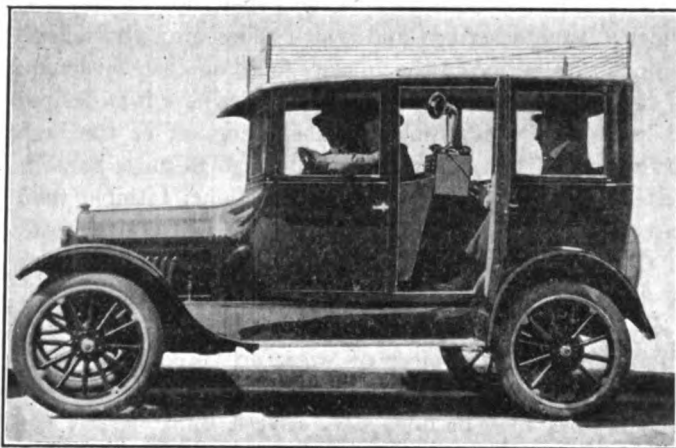
THE RADIO CAR

ONE of the latest radio developments is the radio car. The Chevrolet Motor Company has proved that radio equipment operates satisfactorily in an automobile without the use of a "ground."

The possibilities that this portable radio receiving station offers include an almost limitless field of use and with such tremendous strides as these made in its development, it is bound to become one of the indispensable utilities of modern civilization.

With the car equipped in this fashion it is possible for a family to drive anywhere within 100 miles or so of a broad-casting station and picnic while the radio in their car amuses or instructs them with music, sermons, or wireless telegraphy. Education and entertainment can be transported to wherever people congregate. With a few cars equipped as this one is, a minister could talk to a dozen congregations at once.

If the United States Department of Agriculture had similar radio equipment in the hands of its county agents, department experts could talk to thousands of farmers at



Enjoying a Radio Concert

once and thus bring the tremendous added benefits to our agriculture that would be made possible through a greater broad-casting of its work.

If the political candidate had a broad-casting station available he could send a radio equipped car to every voting area in his state, and talk to all of his constituents at the same time, thus saving his vocal chords and making it possible for his hearers to stop listening when they were tired.

The installation of this equipment in the Chevrolet car is so simple that it is possible to adapt it to many uses, and therefore we may expect to see many cars similarly equipped in the future. It is also only a matter of a few moments to remove the radio equipment from the car when it is not desired for use there. It can then be used in the home or the office, or any other place desired.

Just as anywhere on the high seas ships can keep constantly in touch with ports and other ships through the use of the radio, now the automobile—the land ship—can immensely facilitate distribution of information to the great benefit of mankind.

One ingenious amateur, by utilizing the power of the generator on his car, not only receives messages, but also transmits them.

Such equipment make possible the use of motor cars as scouts or reporters of crop, weather or news messages

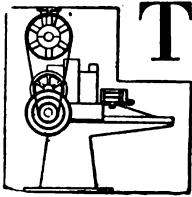
from any part of the country with no given limit.

The news reporter need no longer be obliged to beat his rivals to the wire. With a car equipped to talk instantly and directly with the radio office of his paper, he is free of all restrictions or competition.

Case Hardening Steel

What Packing Material to Use and How to Use It

By J. F. Springer



TO get this desirable result, the case-hardening should be done not by the rapid methods which are based on potassium cyanide or similar substances but by the box-and-packing-material method. Nor, should the low temperature process be relied on, the process which I have described and which relies on a short, low-temperature period in the furnace. To do case-hardening of the character now being considered, where it is desired to have deep penetration and a shading off of the high to the low carbon contents, one must go to more trouble. Case-hardening of this kind may be done, I think, *with success by the repair man*. Perhaps he will not do work of the very highest grade. But he may, I think, do work of a very acceptable character.

However, let him not regard the matter as a trifling affair, but as a real piece of work, to be done carefully and with due attention to the various details.

The work may be done very well, I think, in any gas or oil furnace capable of getting and holding the temperatures required. These temperatures are not excessive, being round 1600° to 1800° F.—say in the region of heat beginning with *orange* and ending with *yellow*. The reader is not to overlook the point that I did not stop when I required that the furnace should be able to *get* the temperature, but added the requirement that it should be able to *keep* it. This is another matter.

Steady Heat Helpful

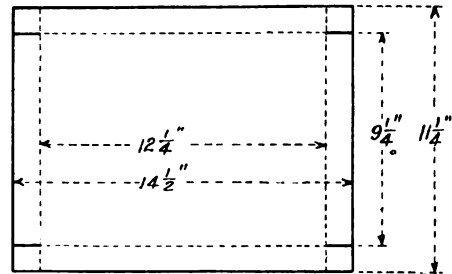
But with a steady flow of gas or with a steady supply of oil, there ought not to be so much trouble. Of course, if the oil furnace is going to let down on its heat now and then, because of some failure of the oil to come through the tip, this would tend to make trouble, because it would just as likely occur when the furnace was not being watched—as, during the night—as when it was being closely attended to. Some oil burners are operated with a steam spray, some with an air spray. If these sprays can be relied on to keep right on the job, then, there should not be any great trouble. The gas furnace ought to run right along without much change.

Naturally, a good many furnaces will fluctuate from minute to minute or hour to hour. It is best not to have

such ups and downs, but the repair man will probably still be able to do good work—though not the best work—if the fluctuations are not unreasonable.

Boxes for Case-Hardening

One may use short lengths of pipe, as explained already; or he may provide himself with something more suited to work of considerable size. The requirement must be borne in mind that between the inside wall of the box and the nearest point of the article should be a space of, say, one and one-half inches. This is to be occupied



Lid for box. Heavy Lines Show where metal is to be cut. Dotted lines within outline of metal indicate where folds are to be made. The drawings accompanying this article are not strictly to scale; the measurements are approximate. The plate steel may naturally be of several thicknesses. The lid is, however, to fit snugly on the box

by the packing material. A similar rule applies when several articles are placed in one box.

The articles must be separated from one another by 0.8 or 1.25 inches or more of the packing material. This applies to all directions—up, down, right, left, etc. It is easy to understand that for two or three not especially large articles a rather large box will be required, so much space has to be reserved for the packing material. However, the one and one-half inches mentioned above is a good allowance. It may, upon occasion, be cut to one and one-fourth inches.

It is not desirable to use a big box, if a smaller one is large enough to enable the packing to be done in the way specified. The big box is not desirable because it takes too long for the heat to penetrate. Again, such boxes are apt to have regions of different temperature. Naturally, the parts next to the walls of the box will be the hottest. Then, those next and further in may be cooler and so on. These differences may, if they are large enough, affect the quality of the results obtained. In short, use a small,

but not too small a box. The big box will be heavy, especially when loaded; and so will be more or less difficult to handle. The following size will be found useful perhaps:

6 by 9 by 12 inches

Or,

8 by 10 by 12 inches

However, a piece of drawn steel tubing may be substituted for the manufactured article. It is said, that the cylindrical box is harder to pack at the beginning and to empty later.

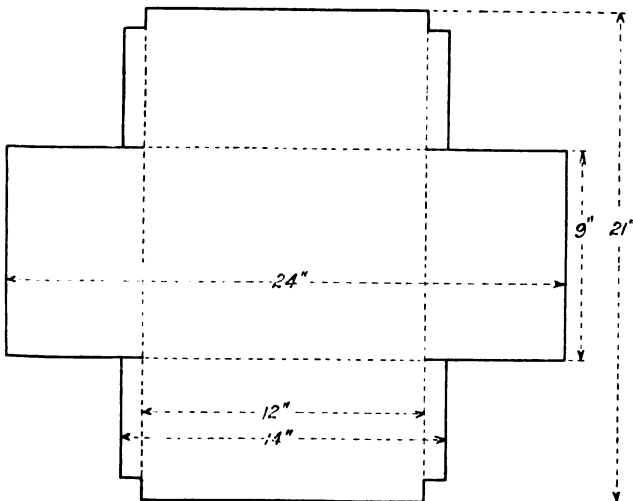
A rectangular box may be made from sheet metal. A pattern is shown in the accompanying diagram. The style of pattern shown here has flaps for bending over at corners. These are to be bent over and then riveted. Finally, the oxy-acetylene welding torch, or that of the oxy-hydrogen process, may be employed to make the seams air tight.

In another view, a section through a joint is shown. From this, the reader may learn where to do the welding. Or, if the box is not to be handled so roughly, simply the welding may be done. Even if rough usage is to be the regular thing, the welding may hold, especially if the man doing the welding knows his business. The lid may be made with a turned down rim all around it. This is to be welded tight at the corners.

Welding Directions

After box and lid have been riveted, the joints are all to be made air tight by welding with the oxy-acetylene or the oxy-hydrogen torch. First, four points at the corners of the box are to be welded up. One of the points is indicated by the letter A.

Then all seams are to be hermetically closed by welding.



The heavy lines indicate where the plate steel is to be cut. The dotted lines on the metal will then represent lines on which the plate steel is to be folded

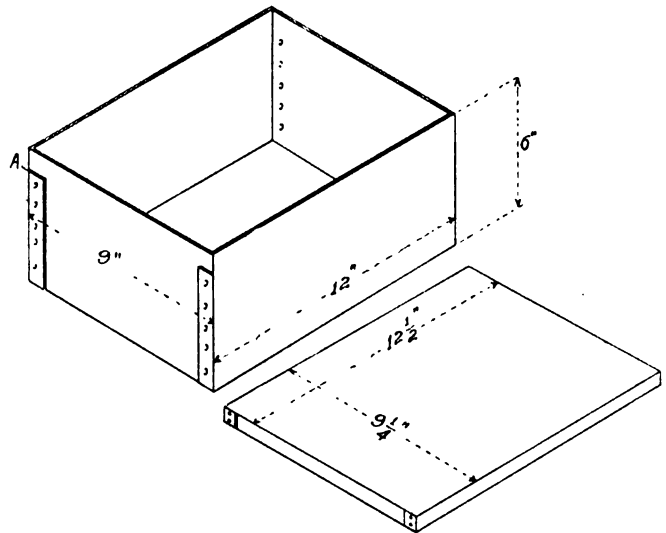
The welding diagram illustrates a representative section through a riveted corner.

The boxes may be made of cast-steel; but this is unnecessary. They are perhaps no better at all. However, even when cast steel boxes are employed, the lids may

be of sheet-steel. The all-sheet-steel box is just the thing for the small user.

Packing the Box

First, put in a layer of packing all over the bottom, making this layer $1\frac{1}{2}$ or at least $1\frac{1}{4}$ inches deep. The articles—or some of them—are placed on top of the layer, the workman taking care that none of the articles



The upper view represents the box after the flaps are folded and riveted. The lower view shows the lid to fit over the box. Four points, one of which is indicated by A, are to be welded up

project down into the layer and that no two are, at any place closer together than they should be. The smallest amount of packing material in between should not be less than, say, 0.8 or 1.25 inches.

If the article is irregular in shape and on this account it happens that it is difficult to place it on 1.25 or 1.50 inches of packing material without some of the parts sticking down into this bottom layer, then we may add a loosely packed layer on top of the 1.25 or 1.50 inches of material. It should then be easier to pack the article in in such a way as to have packing material closely packed against it underneath and yet not have any part of the work too close to the bottom of the box.

Let the bottom layer and in fact all packing material be tightly packed. After the articles have been placed on top of the bottom layer and additional packing material has been tightly packed in until the articles are just covered, a good heavy layer is put in all over the surface. If this layer completes the packing, it should fill the box and should be thick enough *everywhere* to guarantee that no part of the work will be closer to the lid than the $1\frac{1}{2}$ or $1\frac{1}{4}$ inches already mentioned.

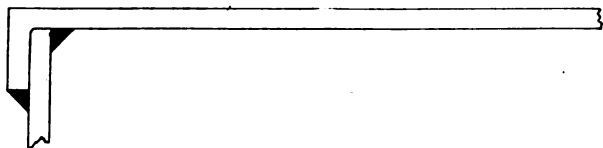
It is often the case, however, that there will be several layers of work. Under these circumstances, the clear layers of packing material between layers of work may often be cut down to 0.8 or 1 inch. But do not make any mistake here, and use a layer of packing material too thin. Let the person doing the packing remember that the carbon for impregnating the articles comes from the packing material. It must be provided, and enough must be provided.

If an intervening layer should be too thin to supply enough carbon—up and down—to provide the full amount, then a defective job is to be expected at the finish. Some carbon comes perhaps from parts of the interior not nearby; but this is hardly to be relied on.

Or, the fact that intervening layers of packing material are made thinner than top and bottom layers may be based on the expectation that some of the carbon wanted above and below will come from distant points. In short, be generous with the packing material, providing enough or more than enough everywhere. The job will probably be accomplished more quickly if everywhere there is a great abundance of the packing material. Put enough packing material all round, so that the vertical walls of the box are never nearer than 1.50 or 1.25 inches.

Finally, put on the lid and apply the mortar made from fire-clay and water, the idea being to seal the crevices everywhere.

To return a moment to the packing. It is customary with some to make a thin paste of fire-clay and water and then paint the metal bottom inside the box prior to put-



Horizontal section through corner when flap occurs. The black regions indicate locations of welds

ting in the first layer of packing material. At least, this is advised by a high authority on the subject. The packing material is not to be added at once. The clay should be allowed to get quite dry.

The packing material should not be at all damp. On the contrary, all packing material should be carefully and thoroughly dried, if it is not certainly known that it is already in a thoroughly dry condition.

The final layer of packing material may be unnecessarily thick because of the requirement to fill the box.

After the lid has been put in place and carefully sealed, the box is ready for the furnace but not for the hottest part. That is, the seal of fire-clay is first to be thoroughly dried. This may be done in the furnace itself, provided there is a comparatively cool place near the door. If there is no such place, let the seal be dried otherwise. Then the whole may be put into the furnace at once and heating up begins.

The Packing Material

The packing material may be any one of quite a number of substances. In fact, it may be a mixture. It is necessary that this packing material shall contain plenty of *carbon*. Pulverized bone is perhaps the most usual thing employed. It is not always the best. But it is undoubtedly one of the cheapest, and this makes it popular, I suppose.

It may be used in the raw state or in the form of charred bone. The raw bone is simply the bones of animals. It is granulated or pulverized and then made

ready for use. But when actually employed, it should be dry, thoroughly dry. Charred bone is bone that has been converted into animal charcoal by means of heat.

All bone contains phosphorus. And phosphorus is not wanted in steel, as a general thing. "When bone-charcoal is ignited, it leaves a residue or ash, consisting mainly of calcium phosphate, equal to from 50 to 80 per cent of its weight." When bone-charcoal is employed as a packing material and the steel box and its contents are heated up to a considerable temperature, we will have a pretty fair chance of getting this calcium phosphate—or rather, one may often expect that calcium phosphate will be reduced in the box and that some of the phosphorus in this calcium phosphate will join the steel at the surface of the articles.

Phosphide of Iron

The result then to be expected is phosphide of iron. That is to say, we are to expect lumps or granules of phosphide of iron on the surface of the finished work. This phosphide of iron is a very brittle article and the lumps and granules are likely first of all to make the surface rough. If they break, then we have a very undesirable surface.

In short, whether the reader understands this explanatory paragraph or not, let him note in his mind that bone contains phosphorus and that this phosphorus may give undesirable results. The rough surface is especially likely to result if deep penetration of carbon is wanted and a high case-hardening temperature is employed.

Blisters and granules are to be expected on the surface. They will be present subsequent to the impregnation and prior to the heating and quenching operations. At the quenching, the grains and blisters are to be expected to split open and leave a very undesirable surface. Sometimes when articles come out of the furnace blistered from phosphorus, these blisters may be ground away by using an emery wheel or the like. This is to be done prior to the final heating for quenching purposes.

Granulated Bone Still Used

In spite of the tendency to get bad results from granulated bone, a great many people are still using it. About ten years ago, the amount of case-hardening material sold in the United States in the course of a year was said to be 100,000 tons. It is understood that 85,000 tons of this total consisted of granulated bone. I do not know whether this proportion is still being used at the present time.

My suggestion to the repair man is to use a better material for his work. He will only do a small amount of work altogether and might very well seek to do that little in the best way he can. He is already at a disadvantage in having to handle matters on a small scale. He will, for this reason, probably have a furnace not exactly the very best. So, then, he is handicapped enough already. Let him use something different from bone, whether raw or charred, and let the big shops use the bone. They may be able to offset or prevent some of the bad results.

Case-Hardening

I am going to give a series of recipes for case-hardening mixtures.

- | | |
|-----------------------------|---------|
| 1. Powdered oak charcoal | 5 parts |
| Powdered leather charcoal | 2 parts |
| Lamp black | 3 parts |
| 2. Powdered breech charcoal | 3 parts |
| Powdered horn charcoal | 2 parts |
| Powdered animal charcoal | 2 parts |
| 3. Wood charcoal | 9 parts |
| Common salt | 1 part |
| 4. Powdered wood charcoal | 6 parts |
| Barium carbonate | 4 parts |

The last is to be regarded as one of the best. No. 3 is said to be recommended by various writers and to be used by many manufacturers. But Giolitti, a great authority on case-hardening, says that No. 3 is certainly less efficacious than No. 4. He goes on to say, among other things, that No. 4 when used for small depths of impregnation is decidedly more homogeneous in its action than are other packing materials.

It is used, as also other packing materials, at temperatures in the region 1652°-2012° F. (*orange to very light yellow*). If No. 4 is used at the *orange* temperature, one is to expect that the outside skin will be very thin and that the carbon percentage will be round 0.70 per cent. This carbon percentage is quite low and means that the shell is not quite a tool steel.

We cannot, therefore, expect to get a very hard result by heating and quenching. But, if higher temperatures are used, one may expect thicker shells of impregnated steel and shells containing a higher percentage of carbon. If the maximum temperature of a *very light yellow* be used, No. 4 may be expected to produce a shell thicker than .04 inch having a carbon percentage of 1.30. That is, combining No. 4 and *very light yellow* for a reasonable period may be expected to result in a fairly thick shell of a very hard tool steel.

More About No. 4

A very considerable advantage possessed by No. 4 consists in the fact that it may be used over and over. That is to say, if the packing material after the first use is saved and spread on a convenient surface in a thin layer, it will recover from the atmosphere a very large part of the carbon lost during the time the packing material was in the furnace. This is a very great advantage indeed.

Reserves

Druggist: How is that cough medicine holding out?

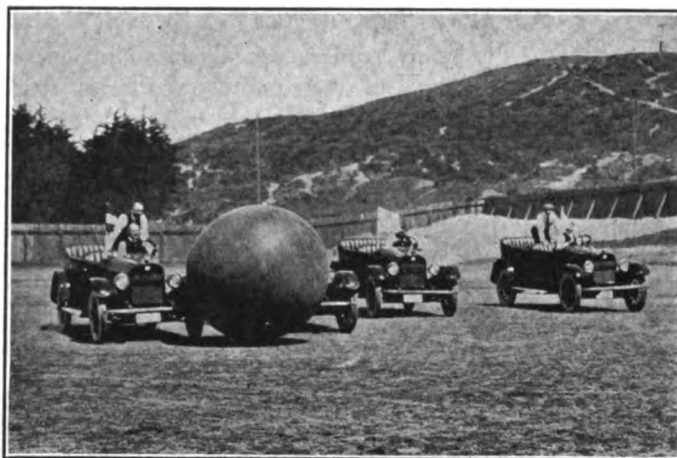
Slimson: I've got enough for a couple more dinner parties.

MODERN "PUSH BALL" GAME

"PUSH BALL," with six Buick cars making up the opposing teams, may well be imagined to furnish more thrills to the minute than polo ever could. It is about as thrilling and exciting a pastime as can be devised.

The cars used in the game are four-cylinder Buicks, with windshields and tops removed. Three cars fly white pennants and three fly pennants of black and white.

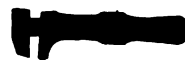
The giant push ball is placed in the center of the field. The six cars are lined up at one side of the field, the men at the other. At a signal, the men make a dash for their



Ready for action.

cars, get them under way and begin the battle. It is an exciting one. As the inflated bag is shoved to and fro between the goal posts, the alert drivers must know how to "steer small," how to twist and turn like coursing hounds, how to stop in a hand's breadth and how to change direction instantly. There is enough danger in the sport to endear it to the average American.

Practically the same rules as those governing horse polo are followed. Up-to-date they have not burst the push ball open, but the strain on it must be terrific, with six powerful cars pushing it, three in one direction and three in another.



DEUCEDLY CLEVER

A young Englishman was walking up and down the platform of a country railroad junction, trying to see a car that had a vacant seat. He didn't find it, and assuming an official air, he walked up to the last car and announced in stentorian tones: "All out here; this car isn't going." There were exclamations low and deep from the occupants of the car, but they all piled out and made their way to cars ahead. The smile on the young man's face increased as he took possession of a seat and appropriated another for his luggage.

"Ah," he murmured, "it's a grand thing to be born clever! Now I wish they'd start."

By and by the station master put his head in the door: "Are you the smart young man who said this car wasn't going?"

"Yes," said the clever one, smiling.

"Well," said the station master, with a grin also, "it isn't. The brakeman who is an old and valued employe

of this road—he heard what you said and he immediately uncoupled it. He thought you were a director."—*Boston Globe*.

The Adding of Electrolyte

If You Intended Asking This
Question, Here is Your Answer

By F. L. Allen



SO many readers ask about adding electrolyte to their storage batteries that I'll try to answer them once and for all. And in my answer I'll try to steer clear of all technical terms. Maybe I won't exactly satisfy the regular chemist and electrical engineer but one must remember that I'm trying to put across the idea only.

Suppose we begin at the end and work backward, for the battery will be easier to understand, if we approach it from that direction. Let us put two plates in a jar of pure water. The plates must be made of lead and a combination of sulphur and for convenience we will just think of them as being plates of lead covered over with a layer of sulphur.

The water will not act upon the sulphur-lead plates at all, so we must start things going by running an electrical current through it. We will "charge" the "battery" which we have made by connecting one plate with a positive source of current and the other plate with the negative source. The electrical current will then flow into one plate, through the water to the other plate and then back to its source.

Water Will Not Act Upon Lead Pipes

Now the flowing of this current plays the deuce with the sulphur for it breaks it away from the lead plates and deposits it in the water. The water, being all wrought up by the current absorbs the sulphur and gradually changes to sulphuric acid. Sulphuric acid is nothing more than a combination of water and sulphur.

As the current passes through the water it picks up some of the hydrogen out of the water and leaves a lot of free oxygen. Water is a compound of oxygen and hydrogen. Now this free oxygen gets lonesome right away and goes to one of the plates, the plate where the current is entering, to see what the trouble is. When it gets there it stays and combines with the lead making lead peroxide, a sort of brownish colored stuff.

Sulphur Does not Escape

The free hydrogen simply floats off into the air and naturally some of the oxygen escapes too; but the heavy sulphur cannot get away but stays either in the solution or on the plates. Finally there comes a time when all of the sulphur is driven off from the plates and is in the

solution or electrolyte as it is called and when this time comes the battery is said to be fully charged.

We started in with pure water and two plates of lead with some sulphur on them and this battery was fully empty. We ended up with one plate of lead with oxygen in it and called lead peroxide and the second plate of just pure lead. The two plates in a bath of electrolyte of water and sulphur which is called sulphuric acid.

At the beginning the specific gravity of the water was 1. for all pure water has a specific gravity of 1. but as the sulphur gradually combined with the water, naturally the water grew heavier until the time when all of the sulphur was in combination with the water, making sulphuric acid. At this time the specific gravity is normally between 1.285 and 1.300.

As the battery is discharged the sulphur gradually deposits upon the plates again until the electrolyte becomes water and the plates become lead and sulphate.

You can easily see that nothing escapes from the battery but a small amount of hydrogen and oxygen gases. The plates or the sulphur cannot fly and there is nothing else to escape but gas. For this reason it is only necessary to put back into the battery the proper amount of gas, or what is more convenient distilled water, for water is really nothing but hydrogen and oxygen gas combined.

Water Alone Necessary Unless Battery Man Advises Otherwise

So if nothing escapes but water, or gas, it is obvious that the battery will need nothing but water and you will only damage it by putting acid in it. The battery man can tell whether or not to add acid and he is the one to consult if you think anything of this kind is necessary.

In actual practice there is always some sulphur left in the water so that there is always a weak solution of sulphuric acid in the battery and it would be practically impossible to discharge the unit entirely. It is also true that there must always be some water mixed with the sulphuric acid in the electrolyte, so that the specific gravity will or should never go above 1.300. The only chance for loss of acid is through leakage and the battery man is the one to consult under such conditions.



Age teaches that the secret of life is not to do what one likes, but to like that which one has to do.

TIRES & REPAIRS

ARC WELDING IN THE RUBBER TIRE INDUSTRY

By A. M. Candy, Arc Welding Engineer

Westinghouse Electric & Manufacturing Company.



IN the process of manufacturing the casings for pneumatic rubber tires such as are used on pleasure and some commercial vehicles, the tire proper is built up to the proper form, after which it is inserted in a large mould of the correct size, which has the proper design worked out on the inside of it to produce the desired configuration of the tire tread.

The general appearance of such a tire mould is illustrated by Figure 1. It will be observed from this illustration that the mould is constructed in two halves provided with lugs around the outer edge so that the two



Fig. 1. Tire Mould. This is the same mould shown in figure 2, after it had been completely welded and ready for service.

halves of the mould can be held together by bolts, each having a T head.

One face of these moulds is a plain surface, as indicated by the front side of the mould, whereas the reverse face of the other half of the mould contains grooves so that a circulation of steam can be obtained when the moulds are placed in the vulcanizers. These moulds are subjected to very rough mechanical handling by the class of labor which load and unload the moulds into and out of the vulcanizing tanks.

The vulcanizing tanks are usually constructed below the floor level, and contain a circular table operated by a hydraulic ram over the top of which a convenient chain hoist is located so that the moulds can be readily lifted

and moved over the table. Approximately twenty of these moulds are piled one upon another on the circular table, which is gradually lowered as the various moulds are placed in position.

After the last mould has been loaded on the pile of moulds the lid is placed on the vulcanizer and secured in position. The hydraulic ram is then again lifted until

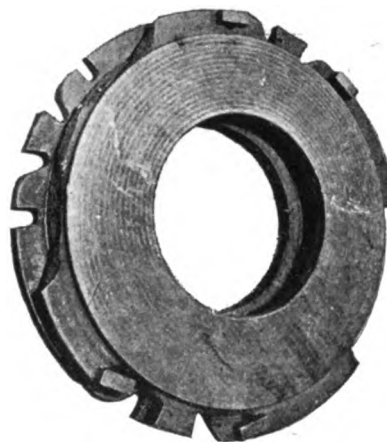


Fig. 2. Tire mould rendered useless on account of severe damage received in service.

the pile of moulds is thrust against the top of the vulcanizing tank, which relieves the bolts holding the halves of the moulds together from most of the strain.

The next operation is then to turn live steam into the vulcanizer, which circulates around all of the moulds and in between the moulds through the grooves in the face



Fig. 3. Mould shown in figure 2 after broken portion was cleaned off and prepared for welding.

of the halves of the moulds. This steam is approximately at 50 pounds pressure. The moulds are kept in the vulcanizer under this steam pressure for a period of four to seven hours, depending upon the size of the tire being

made. At the end of this time the steam is turned off and cold water is turned into the vulcanizing tank to arrest the vulcanizing action, and to reduce the temperature of the mould, so that they can be removed and handled immediately without discomfort to the workmen.

The workmen operate very rapidly in removing the moulds and in prying them open to remove the tires as quickly as possible. It is obvious therefore that the cycle of heating and cooling, together with the rough mechanical handling which these moulds receive, results in a very large amount of breakage. Furthermore, the alternating heating and cooling cycle gradually causes the cast iron to crack and fail. The average life of a good tire mould is estimated at approximately 60 to 70 heat cycles.

A Severely Damaged Mould

A mould which has been damaged severely in service and which would ordinarily be ready for the scrap pile is indicated by Figure 2. It will be observed that the greater portion of the lifting lugs have been broken from the half of the mould on the side toward the observer. To repair this mould properly the surface at the broken portion of the casting was thoroughly cleaned off and a series of holes located on approximately two-inch centers were drilled and tapped for inserting one-half inch diameter bolts.

Ordinary machine bolts were then turned into these holes and cut off approximately one-quarter inch above the surface of the cast iron, as indicated by Figure 3. The next step in the operation was to prepare pieces of steel which could be substituted for the missing lugs, said pieces of steel being formed in the shape required for the finished lugs.

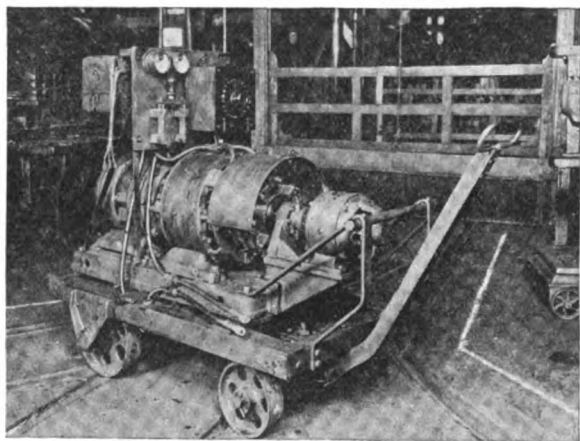


Fig. 4. Westinghouse portable arc welding outfit—single operator, 150 amperes.

This piece of steel was beveled off along the inner edge so that when it was placed in position formerly occupied by the original lug, the welding operation could be carried on along the beveled edge of the piece of steel and the surface of the cast iron containing the studs. One of these pieces of steel in position for the welding operation is also illustrated by Figure 3. This mould after being completely welded and ready for service is shown by Figure 1.

Many of these tire moulds are very expensive, running as high as \$700 to \$800 each, owing to the large amount of hand work required to produce the intricate design desired for the tread of the tire. For this reason, therefore, when they can be repaired for a fraction of the cost of a new tire mould, the welding operation is very effective and economical.

Especially is this true in view of the fact that the tire mould which is illustrated was put through 170 heats, at which time it showed no indication of failure, and the counting of the number of heats was therefore discontinued.

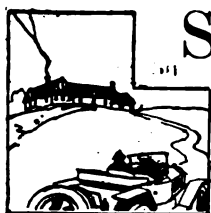
The operations involved and the resulting expense for repairing the mould illustrated is indicated by the following data. It must be borne in mind when going over this cost data that this mould was much more severely damaged than is usually the case.

The preparation of the surface of the casting, including the drilling, tapping and setting of the 150 one-half inch studs was approximately 24 hours. Approximately 8 hours were required to form the pieces of steel necessary to replace the missing lugs. Approximately 40 pounds of welding wire were required to do the welding work, the time required for the entire welding operation being approximately 45 hours.

The welding time for such work as this is unusually long because it is necessary for the operator to weld very slowly so as to reduce the heat accumulation at any given point to a minimum value, in order that the cooling strains be as small as possible to avoid fracture of the welding work when it is finished. The welding in this case was carried on, using approximately 150 amperes, the total power consumption being approximately 100 kw-hour. The actual itemized cost of doing the complete job is indicated by the following table:

Preparation of casting, including drilling, tapping and setting bolts 24 hours time at 60 cents per hour	\$14.40
150 one-half inch bolts at \$2.00 per 100.....	3.00
Steel prepared for replacing lugs, labor 8 hours at 75 cents per hour	6.00
Cost of steel used in lugs approximately.....	1.75
Welder's time 45 hours at 80 cents per hour...	36.00
40 pounds of welding wire at 8 cents per pound	3.20
100 KW hours of power required from supply circuit at 5 cents per KW hour.....	5.00
Grand Total	\$69.35

The welding equipment usually used for performing such arc welding work as just described for the above tire mould is illustrated by Figure 4. The use of this welding equipment, however, is not confined to welding of tire moulds, but can be very effectively used for repairing various pieces of broken machinery around the rubber factory. It can also be used for the repair and construction of steam lines and various other construction work involving the use of steel plates, structural steel, etc.



SO far we have described only the machinery in our repair shop but there are other branches to the trade which are, in a measure, more remunerative than actual repair work. A lathe or a drill press cannot give returns unless someone is operating it and in these days of short working hours, machinery is a dead investment one-third of the time unless the shop is operated night and day.

One of the large branches of the automotive industry is that of battery re-charging and this work holds forth wonderful possibilities at the present time because of the fact that each radio apparatus utilizes one storage battery, usually.

Battery repair work is a branch by itself and we do not advocate it for the small repair shop because it requires special study and experience, but every repair shop would have the equipment for charging storage batteries.

The car owner will also find it to his advantage to invest in a small battery charging device such as we describe herein, so that this article deserves the attention of every reader.

Type Chosen

In choosing a battery charging device for our machine shop we were influenced by many facts, chief among them being the dependability of the product. We chose the F. F. battery booster, made by the France Mfg. Co. of Cleveland, Ohio, because this company produces a representative line of charging machines, large and small. We felt that if the machine, which we have, would give satisfaction, then it is fair to assume that their other machines would also work out to advantage.

In order that our readers may be able to appreciate the various factors which enter into this simple subject of battery charging, let us outline, briefly, the various types of charging devices in use at the present time.

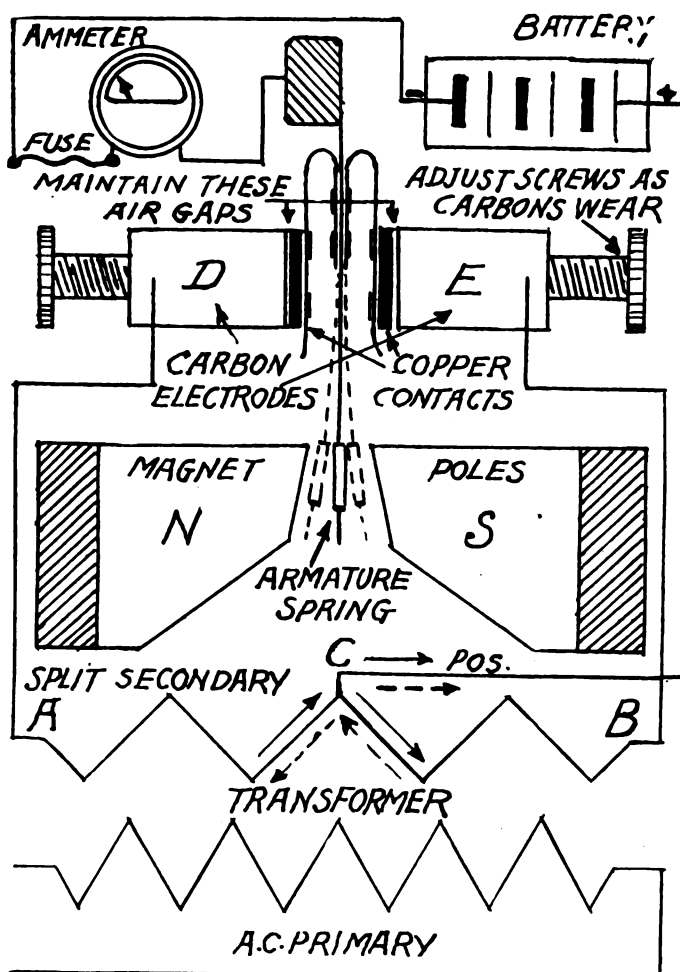
There are two types of current available, direct and alternating, and in charging a storage battery the current must be of the direct current type. For this reason there are two classes of charging devices, in the first class the device operates upon direct current and merely reduces the current to such an extent that it may be utilized for battery charging. In the second class the charging device not only reduces the current but changes it from alternating to direct.

In general most houses and garages are supplied with

alternating current, so that we need be concerned principally with the second class of charging devices.

Alternating current chargers may be divided, roughly, into three classes. First, comes the motor-generator in which a motor is operated on the full line voltage and drives a generator which produces a low voltage, direct current for charging the battery. Such a combination is best fitted for a service station because it is very flexible. It will charge as low as one battery at a time or as many as it is designed for and do its work economically.

Second, come the tube and mercury arc rectifiers. These devices merely convert the alternating current to direct and a certain amount of resistance must be used in the battery circuit to control the charging current. Tube rectifiers are entirely efficient and are to be recommended both for the individual and the service station because with them it is possible to charge a number of batteries



Internal Wiring Diagram of the F. F. Battery Charger.

at one time, or a few, and still obtain efficiency: The first cost is low and brings them within reach of the individual.

Third, comes the magnetic rectifier and this class may be divided into two parts, full wave and half wave rectifiers. The full wave rectifier utilizes all of the alternating current entering it while the half wave only transmits one directional current. This means that in the half wave rectifier only half of the entering current is used.

The F-F battery booster which we have is of the full wave type and is extremely simple in construction. The main unit of the device is an induction coil, the primary of which is connected with the source of current; 110 volts, alternating in our case.

The passing of the alternating current through the primary windings induces a current, in the secondary winding, of a low voltage which is then rectified through a mechanical-magnetic vibrator and passed on to the battery which is being charged.

The Secondary Wiring

The secondary winding is divided into two parts, which, for purposes of illustration we will call the "left" and "right" sides. (Refer to the diagram accompanying this article.) In our illustration A, refers to the left side, while B refers to the right. The winding, then, has three wires leading to it, A, B and C, C is the "neutral" wire and when A is positive C is negative, while when B is negative, C is positive.

Since it is necessary to establish a known polarity in the line in order to connect the battery properly we may say at this point that the mechanical vibrator is so operated that C must always remain positive. Let us explain further.

The passage of the alternating current through the primary winding magnetizes the center core of soft iron wire and naturally the polarity of this core changes with the change in the direction of the alternating current.

Surrounding the coil is a large horse shoe magnet with fixed polarity, shown in our diagram and marked "N" and "S." When the iron core is magnetized in one direction it helps the permanent magnet and when it is magnetized in the opposite direction it neutralizes the magnet. Thus the armature, which is mounted to swing between the poles, must vibrate in tune with the change in direction of the alternating current.

As the armature vibrates it makes a connection, first with the carbon pole D and second with the carbon pole E. If the alternating current is 60 phase, then the armature will touch the electrode E 60 times a second and also touch D the same number of times.

Now let us see what happens to the current which is passing through the split secondary coil. First, let us assume that we are considering the current as it passes toward the right from A to B. The current strengthens the N pole of the permanent magnet and attracts the armature spring so that it make a connection through the carbon electrode D. (The circuit through E is, of course, broken.)

The current flows through the left side of the split

secondary coil, out of C to the battery, through the battery and ammeter to the armature and thence through the electrode D back to the left side of the secondary coil. The current which is set up in the right side of the secondary coil passes as far as the electrode E but finding no outlet cannot escape, so that this part of the coil is practically dead.

On the next half of the phase the current in the secondary coil changes its direction and flows from B to A. This results in the attraction of the armature spring toward the right and contact with E is made and D is broken. An entirely new circuit is set up which we can trace as follows:

Current flows toward the left from B and passes out at C to the battery, through the battery and ammeter to the armature and thence through E back to the right side of the secondary coil. The current in the left side of the coil cannot escape.

It can be seen that the current continues to flow from C, so that C is virtually a positive terminal all of the time. No matter in which direction the current flows in the secondary and primary coils there is an un-interrupted flow of current through C to the battery and back to the coil. The device utilizes practically all of the current, the only loss being that required to operate the coil and the armature, which is extremely small.

Within reason the machine will operate upon a changing cycle and changing voltage. This is a big advantage in country towns where neither the cycle or the voltage can be depended upon absolutely. We have found that the voltage in our shop fluctuates between 100 and 112 and the current cycle varies somewhat as the light load on the service line changes. (Causing the generator at the power station to increase or decrease in speed.)

Dependability

A second advantage of this machine for country use is its dependability insofar as battery protection is concerned. Should the current from the supply cease for any reason the armature comes to rest at a point midway between the magnets and the battery circuit is immediately broken. As soon as the current commences again the battery begins to charge.

Within certain limits the charging rate can be controlled by the electrode adjustment. When the carbon electrodes are adjusted away from the armature, the latter unit "cuts the phase" so that the charging rate falls down to as low as four amperes. When the carbon electrodes are properly adjusted the charging rate is between 10 and 15 amperes.

The machine is semi-automatic in one respect in that it delivers a lower charging rate as the battery is filled. When the battery offers no resistance to the passage of current the charging rate is high, but as the battery voltage builds up and backs against the secondary coil the charging rate decreases. Thus the battery may be left on charge for over-night with no fear that it will be overcharged or discharge itself.

The F-F battery booster weighs less than 15 pounds

and can be used without disconnecting the battery from the car. It is only necessary to find the polarity of the battery, connect the charging wires and screw the plug into a light socket. An ammeter on the charger shows the amount of current going to the battery.

In connecting the battery, to find the polarity, the two battery leads are touched to the battery poles. The armature is swung to contact with either of the electrodes and the ammeter will indicate either "charge" or "dis-

charge." If it indicates the former then the connections should be reversed, but if it indicates "discharge" then the connections are properly made.

The machine is fool proof and the only parts to wear out are the carbon electrodes and possibly the armature spring, either of which may be replaced at a nominal cost.

We feel entirely safe in recommending this device to our readers.

Overhauling Vs. Underhauling

By J. F. Malloy

Superintendent of the Cleveland Top & Specialty Co.



EVERYTHING O. K. now, Miss Anthony! Ready to take out." Clyde Weaver who runs the principal garage at South Portage grinned with anticipation of her pleasure.

"Valves all ground and adjusted; new piston rings; bearings tightened; transmission tightened; spark plugs cleaned—put in one new one; went over the wires and they're all Jake. Just listen to this! She's really better than new."

The popular school teacher of District No. 4 registered only a fraction of the pleased surprise that an enthusiastic service man might have expected and the grin faded from Clyde Weaver's face. Looking closer, he found that she was frowning just a little.

"It looks like the same old contraption," she explained, aware of his disappointment. "When you talk about 'better than new' it reminds me of how proud I was when it first came from the factory without a scratch or a spot of dust on it. Still, it wouldn't be so bad if it weren't for that disreputable old top. You said you would overhaul it and I should think overhauling would begin with the top. When I watched you work, it looked more as if you were underhauling it."

"Underhauling"

"Underhauling! Say that's good. I'll have to tell Ernie what you called it. Underhauling!"

"I suppose a new top would cost as much as the whole job."

"Maybe it would, Miss Anthony. No. Wait a minute. Maybe I can fix it up so it won't cost so much."

A short search through the pigeonholes of the garage man's desk brought to light the booklet that he was looking for, an illustrated price list of Top Recoverings, made to fit any and every make of car. "Would you be willing to pay about sixteen dollars extra to have that top fixed up so that you wouldn't know it from the day it was first delivered?"

"I would, in a minute!" rejoined the school teacher. "Why, I thought that tops cost forty or fifty dollars anyway!"

And then, changing the subject Clyde said:

"That's a mighty nice suit you got on, Miss Anthony. I suppose you went to the very best ladies' tailor in the city to get that made."

"Why no, Clyde, as a matter of fact I didn't. I got it ready-made right here in town."

"But if it had been made by a tailor, it would cost you sixty or seventy dollars, wouldn't it?"

"Yes, I suppose if I had gone to a first-class tailor and had this made specially, the bill would have been about that figure."

"But, instead you went to the store and bought it for—"

"Twenty-three, seventy-five."

"And it fits you perfectly and makes you look as trim and stylish as any dame on Fifth Avenue, don't it? Now, if a suit factory can make a suit that fits you like that when there is nobody else like you in the United States and can sell them at quantity price, hadn't a top factory ought to be able to turn out a mighty good top for your car at an awfully close price when there are thousands and thousands of such cars over the country, with just the same measurements?"

"It sounds reasonable."

"Another thing! You don't have to replace everything in a top recovering job. The bows and pads are all right and your side curtains haven't been used very much. We needn't replace them. You take this car and drive it a couple of days and come in again on Thursday and I'll have you all fixed up in an hour or two."

"Will you, Clyde? I think it's awfully clever of you to get me exactly what I want at such a reasonable price. You certainly help me out every time I'm in trouble."

As a matter of fact, the favor was returned before it was done because Miss Anthony had been the means of calling the garage man's attention to a highly profitable and legitimate sideline of his business which he had heretofore overlooked, the top renewal feature.

Like a good many mechanics in the automotive trade, his mind was so closely focused on the mechanism of the cars that entered and left his place of business that he

had grown more and more indifferent to questions of outside appearance.

Now a different point of view asserted itself. As he said to Ernie, later in the day, "I'm glad I looked into this top recovering game. Of course I don't claim to be a trimmer, but I can drive tacks and I know whether a piece of fabric is straight or crooked. Nine times out of ten when a top looks bad, all it needs is a new cover that you and I can put on."

"Lots of times, looks mean more to a customer than a good engine. Take the job on Miss Anthony's car, for instance. As nice a running job as I ever turned out, but she goes and breaks her heart because it still looked like the same old car. Of course she's a woman, but lots of our customers are women—

"—of both sexes," assented Ernie.

A brief wire to the top factory had already been dispatched and late the next day the new top was on hand. It came in two pieces, back curtain and roof. Printed directions, tacks and welt were included.

The next day Miss Anthony left her car again and Erie went to work removing the tacks that held the old top in place. Then Clyde took a hand, stretching the

quarter pads and strainer strap to take up slack, retacking them and cutting off the fraction of an inch that represented stretch.

The back curtain was then hung from the back bow by four tacks and more carefully tacked to the trim rail below, but no tacks were driven home until every pull and wrinkle had been taken out, a number of tacks being drawn and re-driven in the process.

The roof was stretched with four tacks at the front and four at the back. Tacks were drawn and replaced until the fit was pronounced perfect. Then the whole job was securely tacked in place. Welt was fastened over the tackheads with special small japanned tacks. Then Clyde drew off and examined his work.

"All set," he remarked. "I could do it in an hour with a little practice."

When Miss Anthony came in that night, after school, her enthusiasm fully justified the garage man's pains. "After this," she remarked, "when you say you are going to overhaul a car, do what you promise! Don't just underhaul it."

"Yes, teacher," Clyde answered. "You certainly taught me a lesson."

Why Headlight Bulbs Burn Out

By F. L. Almy



WE ARE frequently asked why headlight bulbs tend to burn out even though the voltage stamped upon them is greater than the rated capacity of the electric system upon which they are used. We are considering those electric systems which operate upon storage batteries and generators and not the Ford system where only the magneto is used for lighting.

Practically every lighting system in use on automobiles today consists of two main units, a generator and a storage battery, the minor, but necessary units to such a system being a regulating device for controlling the generator output, a cut-out for preventing the battery from discharging when the generator output falls too low, and the necessary switches.

There may be combinations made of these units so as to eliminate the many parts and perhaps the simplest system is the Delco as applied to the Hudson and Oldsmobile cars. This system consists of a generator (and motor combined), a battery and a switch, the latter being used for ignition. The generator is of the third brush type and is, therefore, self regulating and the ignition switch takes the place of the cut-out since it is "on" only while the engine is running.

So long as the system is complete and all of the above units function properly it is impossible to generate over a certain voltage depending upon the design of the generator. In general most systems are designed for six volts.

But should one of the units fail, or become disconnected or be short circuited, then the voltage control ceases and the generator virtually "runs wild" burning out the lights, perhaps destroying the ignition system and even the generator itself.

In practically every case the generated current is controlled, either directly or indirectly from the storage battery, this is especially true of the third brush type of generators in which the current produced depends for its balance upon a counter current from the battery.

The battery might well be likened to a water tank, the generator to a pump and the light bulbs to a faucet between the pump and the tank. Let us consider this water system in conjunction with the automobile lighting system.

Suppose the water pump (the generator) were started and the water (current) were allowed to flow out of the faucet (light bulbs). So long as the system were connected with the tank, the flow of water would remain constant and the pressure of the water flowing from the faucet would be equal to that from the tank, regardless of what the pressure from the pump might be.

If the pump furnished a pressure of 60 pounds per square inch and the tank, when full produced only 30 pounds, then the additional water driven from the pump would merely overflow the tank and the pressure at the faucet would be only 30 pounds per square inch. (Assuming, of course, that all the pipes in the system were amply large enough to carry the water.)

So it is with the electrical system, additional current will, within reason, be taken care of by the battery.

But suppose the tank were removed and the opening plugged so that no water could escape. Then the pump would pour water into the system and if it furnished more water than could be poured out of the faucet the pressure would increase until some part of the system smashed. And this is what usually happens when the storage battery is removed from a car and the generator is operated. The voltage jumps up and burns something, or everything out.

It follows, then, that the first thing to look for in the case of headlight bulb destruction is the connection between the generator and the battery. If the system has a grounded return then the ground connections should be removed and cleaned. The cables at the battery should be scraped clean and the battery posts wiped off.

But there are other kinds of systems in which the battery does not play such an important part. These might be likened to the water system in which the removal of the tank does not mean the closing of the pipe which leads to it. But the reader can never be sure that his car is fitted with such a system so that it is always safe to examine the battery connections in all cases.

In certain systems the third brush type of generator is not used but the control of the current output is through a regulator. This regulator is so designed that it will carry a certain amount of current but when the current increases over this point, a magnetic switch closes and diverts the current through a resistance winding. This resistance cuts down the current flowing through the generator field windings and the output naturally falls.

Should the connection with this unit fail, then the current output ceases, but if, by any chance, the contact points stick, in the regulator, or the springs, which hold the contacts together under normal operation, be bent so as to hold the contacts together all of the time, then the current output increases with the speed of the engine.

Many systems combine the cut-out and the current regulator in one unit and such is the action of the cut-out that it influences the current. For this reason the cut-out unit must also be examined in cases where the light bulbs tend to burn out too rapidly.

Any short circuits in the regulating device or the wiring leading to it, or across the generator terminals may result in excessive current in the line. But it must always be remembered that the lights themselves will be good indexes of the conditions.

If the lights suddenly flare up brilliantly and then go out you can feel pretty certain that the storage battery has been cut off or the connections so loosened that it is not balancing the line.

If the lights burn too brightly all of the time while the engine is running but are normal while the engine is stopped, then the regulator is at fault or the battery connections are poor.

If the lights gradually burn brighter with the increase of the engine speed and, when they are dazzlingly bright

suddenly drop back to normal, then the regulator points are sticking.

There is one other reason for trouble which we have not considered because it is so remote and there are other more pronounced symptoms of it. We refer to the possibility of a break in the storage battery either through the weakening of one cell or the breakage of one of the connecting straps.

The quickest test for battery connection or battery trouble is to stop the engine and try the self starter. As a rule the starting motor will not be strong enough to turn the engine over unless the battery is in condition and all of the connections with it, in the starting line, are good.



THE STUDENT

As the boy who tended the newsstand was absorbed in reading a book, I hunted around until I found the magazine I wanted and then approached him. When I spoke to him he did not raise his eyes from the page, but held out his hand for the coin and dropped it automatically into the till. I said:

"Where's the change?"

"What did you get?" he replied, still without looking up.

I told him.

"How much is it?" he asked.

I said I did not know.

"Can't you read it on the cover?" he inquired crossly.

Thus admonished, I searched the cover until I found the price-mark tucked away in the hair of the pretty girl picture. When I told the newsdealer he tossed the change over the counter. One of the coins rolled on the floor, but I recovered it while the boy read on.

Curious to learn the nature of the book he was reading I glanced over his shoulder at the title.

It was called "The Science and Art of Salesmanship."
—E. E. Slosson, in *Independent*.

Cause For Thanks

"What do you think of the two candidates?" asked one elector of another.

"What do I think of them?" was the reply, "Well, when I look at them I'm thankful only one of them can get in."

—*Driver Dan*

When a dog's a Dawg

Small Girl, at charity fair—"Ain't that a nice little dawg?"

Duchess of Dingdong, owner of the animal—"It's a dog, child; not a 'dawg.'"

Small Girl—"It's awfu' like a dawg, ain't it?"—*Tit-bits*.

If a bee can sting like the devil on a diet of honey what would he do on a diet of lemon juice?

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M. T. RICHARDSON
President and Treasurer

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Secretary

M. T. RICHARDSON, Editor
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H. M. MENDEL, Associate Editor

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Do You Know the Game?

WE don't often moralize in these columns for it is very difficult to write a sermon upon automobiles. There have been many sermons preached over the remains of an automobile accident, but it is doubtful if the survivors cared to be mentioned and the automobile itself is usually too far gone to deserve any place in the scheme of things.

But in going through our "exchanges" a few days ago we came across a clever story in "The Leader," a Chicago publication devoted to this trade and the story is well worth repeating. We will cut it down somewhat to save space.

"For twenty years two chess players met daily at Brown's Chop House and silently played their game. For twenty years a third man was punctual and sat by silently intent upon the progress of the game. And then, one day, the first time in the whole twenty years, one of the players failed to appear. His partner waited a few minutes and then asked the silent onlooker if he cared to play the game for that day.

"The silent onlooker for twenty years seemed a bit surprised and then replied, 'Sorry, but I don't know the game.'

"That man had followed every move for twenty years, but didn't know the game. He had watched a game for twenty years without seeing a thing, without speculating

upon a single move or anticipating a single coup."

As we look about us in the public parks we find thousands of men who are in exactly the same position as the man who watched the chess game. These men sit upon the park benches, staring ahead and sensing nothing. As we go about our daily tasks we constantly come into contact with fellow workers who do not know the game; men who work at a desk, in the shop, or at a machine, many years without knowing anything about their fellow workers' jobs.

The lesson in this short story is clearly stated in the last paragraph of the "Leader's" article and we can do no better than to quote again.

"Placed in an office—at a bench—he would remain twenty years ignorant of his neighbor's job, his superior's problems, his own significance. When the opportunity for advancement came, he would have to say, 'Sorry, but I don't know the game.'"

Charging Storage Batteries

IN this issue under the heading of "Our Own Repair Shop" we are publishing a descriptive article which deserves the careful attention of all our readers. The automobile is becoming such a popular machine that nearly every one person out of every ten is a car owner. Over one half of the car owners are workers and the only time they have to drive their machines is during the evening and on holidays. The average car is equipped with a generator which is designed to keep the battery charged under normal conditions.

"Normal driving conditions" is a much abused term and we doubt if many cars are driven under such conditions. When a car is driven during the evening and lights are necessary the generator cannot be expected to replace the current taken from the battery. The average generator is designed to take care only of the maximum load and when the car is driven at night only, the battery receives little or no charging current, all of it being used for the lights and ignition.

For this reason the average owner finds it necessary to have his storage battery recharged several times during the season. If the battery is stored during the winter, then it should be charged at least three times, or once a month, or it will depreciate to an alarming extent.

It is a fact though not generally known, that the misuse of one winter's storage of a battery is often more destructive than the actual usage during the motoring period.

A storage battery might easily be likened to a water pail standing out of doors. If the pail is left empty or only partially full the sun warps the staves and even if it doesn't fall to pieces, it will leak above the water line. If, on the other hand, the pail is kept full of water, with water running down the outside constantly, the wood will rot and the pail be ruined. And it will surely fall to pieces if it is left empty for any time.

The happy medium, obtained by filling and emptying the pail occasionally, is what is most desirable. The pail will last longer than under any other usage. And it is so with the storage battery. Leave the battery empty and the plates are soon covered with a heavy skim of sulphate which decreases the battery's capacity and destroys it. Keep it filled to running over, with current, and the plates are shed and dissipated.

The average generator will charge at the battery voltage and deliver from 5 to 12 amperes of current. Normally this is ideal, but there is a gradual formation of sulphate, extremely hard and tough, which cannot be broken down by this amount of current. The battery will gradually lose capacity unless a heavy current is employed to break down the hard sulphate.

And when it is considered that hundreds of our readers are probably "radio fans" it is obvious that there are thousands of batteries, owned by our subscribers, which need be recharged several times in the course of a year.

A battery charger is a practical device for every car owner because it is bound to pay for itself in a short time. Assuming that the average storage battery has a 100 ampere hour capacity and that it is usually at least half full, it requires 300 watt hours to re-charge it (if it is a six volt unit). The average cost of current is around 90 cents a kilowatt hour which means that the cost for re-charging such a battery is but 30 cents, at the most.

If the battery is in any decent condition it does not require even a half charge but only enough at a high rate to break down the excessive sulphate. We have found by experience that an average of 100 watts, applied to the battery five times a year, will keep the battery in excellent condition if it is not abused.

The cost of maintenance need not exceed 45 cents, or about one-third what it would cost were the battery taken to a charging station, if the owner only makes a small initial investment in a battery charger.

As far as the service station is concerned we need not say much in favor of battery charging units. The service station which is not equipped to give battery charging service is not worthy of its name.

We do not mean to hold that a storage battery does not need the attention of a service station if the owner charges it himself, for this is not so. Under normal conditions, barring breakage and mis-use, the battery will not need the attention of a service station more than once a year and not even then if the owner familiarizes himself with the construction of the battery and knows when that unit needs attention.

In our article we have tried to consider the various types of charging devices impartially and for this reason it should be of interest to all those who are expecting to invest in charging devices, either for large service stations or single car use.

A Low-Priced Private Garage

How to Convert A Barn or Woodshed Into a Place to Keep the Car

By Helen G. Hampson

WITH lots of car owners and prospective owners, the question of the hour is not the car itself, it is where to keep the car. Once you have a garage of your own, it costs nothing to store the car and you can save the cost of a modest garage in two years' time out of the cost of live storage in a public garage. But countless owners have strained their purses in buying the car and must practice the strictest economy in car housing, for a time at least.

Outside of the large cities, the car owner has a choice of two methods—either building a garage or converting some building already on the place. Many persons put up their own—yes, women too. It is, however, of the way to convert some existing building that I wish to speak.

The existing building may have been a barn or a woodshed or a tool house. If it has been a barn, it is big enough and may do without any alterations aside from those necessary to put the floor in good repair. Let it be said in passing that the automobile will be the better for a dry clean floor above ground, cobwebs and dust brushed away, a ray of sunlight through the windows, and a general cleansing—formalities which were not considered essential in horse drawn days.

The woodshed or other outbuilding will generally need a straightening up to bring up the floor level and to transform it from a semi-dilapidated appearance to a trim neatness in keeping with the new self respect that comes with car ownership. An ordinary carpenter's level is the best instrument to go by. This may be used outside in a vertical position and inside upon the floor. Usually such buildings are supported on the four corners by stone or brick piers and at intermediate points under the joists. In time, these piers get undermined or the joists rot and it is that which lets the building get out of plumb.

To one who has never attempted it, the task of moving or raising even a small building seems beyond the scope of home workmanship but, really, after learning what to do, it is very simple for any man or woman and it may be done alone if one cannot get assistance. (Less adventurous spirits will prefer to subscribe to the time honored panacea of "getting a man" to do the work). All the tools required are an automobile jack and a length of timber.

Wherever there is a space of eight inches, the auto jack

may be put under the sills or joist and that section of the building raised as is a car axle. A screw jack is more convenient for this purpose than the ratchet jacks. If the ground is soft, a piece of board or a flat stone ought to be put under the foot of the jack to prevent its sinking. The jack should be put in a short distance from the pier-to-be so that there is a chance to work at the latter. Then the pier is laid up in masonry or built up out of bricks laid dry upon each other or large stones rolled in place. Such a foundation is ample for ordinary car weights and the buildings which will house them.

In order to get the building plumb, square and level it will be found necessary to go around it perhaps twice with the work, for the raising or lowering of one corner affects the adjacent ones and it is rarely possible to get it right the first time.

If the floor is to remain of wood, it is far better for it to be some inches above the earth to keep it from drawing dampness and rotting out. But a building may rest on the ground if the timbers are thoroughly coated with tar—in that case it is best to put in a cement floor from timber to timber and retain the latter as a support for the sides.

How to raise a part of the building that is on the ground or so near to it that a jack cannot be placed under the beams is something of a puzzle but it was for this part of the work that the stick of timber was named. The principle involved is as old as Archimedes—it is that of his lever. With a "two by four" or a piece of stout tree limb, tremendous loads may be lifted a short distance by a person weighing no more than a hundred pounds. It is entirely a case of proportion—the nearer one places the



Raising a Part of the Building.

fulcrum to the load, the more can be lifted by the person at the "power end." We learned this in elementary High School Physics but forgot to put it in practice.

The photograph shows how a person may work single handed if necessary. That portion of the building was sagged badly but had a good heavy flat stone as a beginning on which to build. By digging out a little, the limb could be nosed under the sill and then with a fulcrum block about a foot away the pry was complete. A brick proved to be of correct height to go under the sagged portion and it was placed close up to the building, ready to be shoved under when the sill was raised.

It was easy enough to raise the building when sitting

on the end of the limb but how to push the brick under from that far away location was not as easy. However, with a woman's weapon—the broom handle—the brick was pushed into its location in a hurry. This is a simple expedient that helps out many times in leveling up a small building far from other help.

Bricks or stones or cut wood blocks may be used to raise several inches; for the final close work, shingles are convenient. Shoring up in this manner is good as a permanent job or it may be done temporarily while forms are built for concrete piers or a solid concrete foundation.

The foundation ought to be all completed before the concrete floor is begun. The latter ought to be a four inch layer in the proportion of one cement, three sand, and six gravel with a richer coating trowled off on top—this laid on a bed of cinders makes a splendid garage floor for the private garage and it is within the reach of the car owner of moderate means.

HOW TO DETERMINE IF THE CLUTCH IS SLIPPING

By L. R. Prindle

THE clutch that reaches the condition known as "slipping" is wasting power, fuel, as well as causing a needless strain on the engine. This may be brought about by "clutch riding" or driving with the foot constantly on the clutch to glaze the engaging members. As a rule the average operator can recognize this trouble, for it is usually very noticeable in driving. However, the driver may ascertain whether or not the clutching is imperfect by the following tests:

With the car standing and the engine running at a fair speed, or equal to about that when the car is traveling eight miles an hour, put the gear shift lever into first speed position, set the emergency brake and allow the clutch to engage fully.

Under these conditions the engine should stall at once, if the clutch is in proper condition. But should the engine continue to turn over and the brakes are on it is evident that slippage is taking place. See that the clutch pedal is allowed plenty of freedom when engaging, or not coming back against the floor boards.

Thus when driving on the road and the engine seems to overheat from no apparent cause, or the gasoline mileage is less than formerly, the engine lacks power, it is highly important that this test be made if one would save much in the cost of upkeep.



Johnny—"Did Moses have dyspepsia like what you've got?"

Dad—"How on earth do I know? Why do you ask such a question?"

Johnny—"Well, our Sunday school teacher says the Lord gave Moses two tablets."

Changing Carburetors-Setting Valves

Working Further to Bring the
1914 Cadillac Car Into Condition

By J. F. Hobart



When bringing a 1914 Cadillac automobile up to condition after it had been sadly neglected by a former owner, it was found necessary to discard the old-fashioned jet carburetor as unfitted to present day gasoline. A new carburetor was installed and the first time gasoline was turned on under one pound air pressure, the gas ran out of that carburetor faster than maple sap out of a sugar tree in March!

The carburetor was taken out and closely examined. There was a drain cock—one of the regular and abominable “pet” cocks, in the bottom of the bowl, and its stem was crosswise all right. But the workman applied his lips and found he could both suck and blow air through the pet-cock very readily. The confounded thing was wide open, and with its thumb-stem crosswise! The cock was closed, the carburetor replaced and gas turned on again only to leak out through the vent hole under the choke valve. The pet-cock was tight but the float valve didn’t hold.

The carburetor was taken all to pieces and the float valve removed, when it was found that before the valve could fairly enter its seat, the stem of the valve would rub against the jaws of the float lever. It was necessary to do considerable filing and fitting before the float could be made to work properly without its lever binding against the float stem. In fact, this valve has never been made to work so it could be trusted. Sometimes, it will hold gas out of the carburetor very well, and other times gas will drip out of the carburetor (when the car is stopped) through the drainage holes in the carburetor which evidently were placed there for just such happenings, and for superfluous gasoline!

Beyond a doubt, the trouble was due to improper manufacturing; the parts, having gotten past the inspector without having been properly fitted. The carburetor, however, is in daily use and works fairly well, but its owner always takes the precaution of shutting off the gasoline supply at the tank whenever he leaves the car for more than a few minutes.

An Increase of Mileage

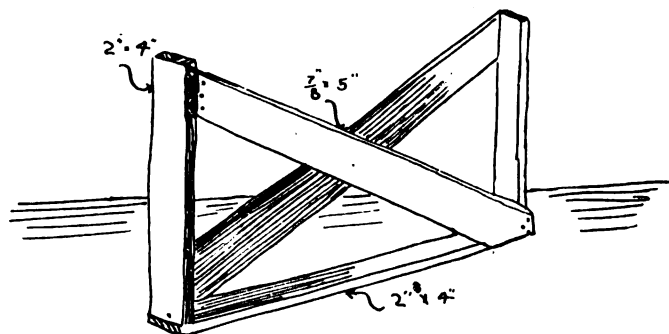
The new carburetor increased the gasoline mileage from between five and six miles to about fourteen and one-half miles; and when the car was run for a considerable distance on the high speed, sixteen and seventeen miles per gallon of gasoline were obtained.

Every time the car is driven to a certain garage for gasoline or oil, the owner of said garage suggests that the owner put a “real” carburetor on his car.

The car owner is “from Missouri” a-plenty, for he must be shown beyond a doubt that the recommended instrument is better than the one now in use. The car owner facetiously told the garage man that he wanted to sell a carburetor. To this the garage man replied that the car owner might purchase the carburetor himself, he was only advising the owner for the good of his car.

Grinding-In the Valves

One day the owner of this car got “busy” and ground-in the eight large valves with which the car was fitted. The valves were not in bad condition, it was only necessary to apply grinding material to the valves next to the crank end of the engine once and only twice to



To Support the car after it had been raised.

those at the rear end. But after the valves had all been nicely ground and nicely replaced, Mr. Car Owner started for town and found great difficulty in driving the car out of his own yard.

Seemingly there was scarcely any power developed by the engine, which would stall before the car got fairly in motion. Once under way, however, the car ran along at a fair rate of speed but the engine heated badly, the radiator boiled out its water and had to be replenished after going four miles.

He Reset the Valves

After getting home the owner went to studying hard to see what ailed his engine. Finally it occurred to him that grinding-in the valves might have changed the time of the opening and closing, accordingly he pulled up the foot-boards and examined the fly-wheel closely where he found the following marks—

- C. Center
- I. O. Inlet opens
- I. C. “ closed
- E. O. Exhaust opens
- E. C. “ closes

He found that each one of the above appeared twice

on the face of the fly-wheel. He found that when C appeared exactly at the top of the fly-wheel it indicated that the crank-shaft and pistons were on "center," that is that two of the pistons were at the highest point and the other two are at their lowest points.

He found that the positions of the letters on the fly-wheel indicated the correct timing of the valves. This being a "T" head engine the inlet and exhaust valves had to be timed separately.

In timing the valves the owner found it necessary always to turn the engine in the direction in which it runs. For the forward cylinder, he timed the inlet valve so that it would just start to open when some part of the space marked I. O. was at the top, underneath the pointer, which is fastened to the crank-case of the engine. In like manner that valve will just be entirely closed when the line marked I. C. on the opposite side of the fly-wheel, has reached the top.

He adjusted the exhaust valve so that it would begin to open when the line marked "E. O." is at the top under the pointer and so that this valve will just be entirely closed when one part of the space marked by the "E. C." on the opposite side of the fly-wheel has reached the top.

Adjusting the Valves

Both valves belonging to each cylinder were adjusted in the manner indicated above and the adjustment was made by manner of the screw on the cam roll slide.

It was found that turning the screw in the cam roll slide to the left (screwing it out) caused the valve to open earlier and close later, by turning the screw in the cam roll slide (screwing it in) to the right, caused the valve to open later and close earlier. After each valve had been carefully adjusted in this manner and then carefully checked and checked and the screws carefully locked in place, the owner found that he had no more trouble from heating; the engine had power a-plenty and the engine would also pick up instantly that the throttle was opened. But some of the push-rods made a noise, there was considerable space underneath them.

Junk in the Garage

One garage which the writer visits frequently, had ten or fifteen boxes, more or less full of what appeared to be junk. There were screws, nuts, washers, set screws and all manner of parts used in the repair of automobiles, and when a nut or a screw was needed by a customer or by the repair man, it was necessary to hunt through one or more boxes (usually more) before the required piece was found.

The writer had fallen into the habit of going to this garage when he required an odd piece of mechanism and frequently he would be handed a box with, "Just hunt it out for yourself." One day sometime ago the writer wanted a certain size cap-screw and remembered having seen some in a certain box in the garage in question.

Walking into the garage he asked the attendant "to let him see the third box on the second shelf." "There ain't no third box," said the attendant and sure enough

the boxes were all gone. "Where has all the junk gone to?" asked the writer? "It's in the office," said the attendant and sure enough, the garage owner had purchased a set of wall boxes, a screw cabinet, and a washer case. All of the so called "junk" had been sorted out, placed in the cabinet and boxes and was on sale and could be found if wanted and when wanted without hunting over from ten to fifty pounds of junk when seeking for the part required.

Blocking Up the Rear-End

Upon returning from a 60-mile drive, a peculiar knock was noted in the car and listening by everybody on board failed to locate the position of the noise. The engine was declared "not guilty" and the sound was one of the peculiar ones which seemed to come from everywhere and no place in particular.

Finally one of the passengers discovered that the noise was heard exactly once at each revolution of the rear wheels and the car owner felt a sudden sinking in the pocket book as he visioned the ordering of a new 12 or 15-inch rear axle gear. Once established, the noise continued with equal intensity, never missing a wheel revolution and never becoming louder nor softer.

Under slow speed—but in "high"—the car was driven home and a rear wheel jacked up and then turned slowly. Yes, there was the "thump." The wheel turned easily until a certain point was reached where it wanted to stop, and required quite a strong impulse to make the wheel keep turning. Once each revolution, the hard place appeared but after this had been passed, the wheel revolved easily during the rest of that revolution.

Novel Blocking

Sections of a 12-inch pine log, cut 12 inches long, were used for blocking, and right good blocking it made too. It was necessary to place the jack under the end of one of the U-bolts which secured the rear axle housing to the side spring, this being the easiest place to make the jack "take hold" but the car owner paid therefor when he came to take off and replace the nut from that U-bolt, for it was well headed over upon the nut!

As the jacking-up proceeded, a follow-up blocking was built closely under each rear wheel, the jack not being allowed to raise a wheel more than four inches before its blocking was built right up the wheel again. Being desirous of removing the rear axle without taking down the gasoline tank, the rear end of the car was necessarily jacked up pretty high, all of three feet.

The forward wheels were securely blocked, four pieces of wood being placed under each wheel which was first jacked up and a piece of board three feet long and ten inches wide, slipped under each front wheel. The floor of the garage was of concrete, and the owner determined to take no chances of having a "flip" after the car had been jacked up. Hence the board under each wheel.

The four blocks under each wheel were made of wood, two pieces of 1-inch x 2-inch, and two, of 2-inch by 4-inch stuff. A corner was roughly chamfered off each

(Continued on page 58)

Automobile Storage Batteries

The Lead Grid the Subject of the Fourth Article of the Series

By Sydney F. Walker, R. R. N.



THE lead grid has taken various forms, all designed to hold the active material closely, while allowing room for expansion and contraction; it should be mentioned that the active materials occupy different volumes before and after charge and discharge; the addition of oxygen adds to the volume of the material, and to the space it tries to occupy, deprivation of some or all of its oxygen reduces the space it seeks to occupy. This again is one of the causes of the tendency of small portions of the oxides to break away; at every charge the oxide on the anode increases its volume and that on the cathode decreases, and on every discharge the reverse takes place.

All forms of carriers, of electrodes or grids, for holding the oxides are practically cages. Some of the forms are shown in the illustrations accompanying this article. A favorite form is, the volume that is to be occupied by the completed plate is divided vertically and horizontally into squares, larger or smaller according to the size of the plate; see Fig. 1, the size of the plate will depend upon the strength of the current it has to accommodate during charge and discharge.

The carrier cages are made of lead carefully selected, very pure, but strengthened with a certain percentage of antimony or other alloys. The addition of a small percentage of antimony or tin, adds considerably to the tensile strength of the bars of which the cages

forces to which they were subject during charge and discharge.

Modern grids, the writer believes are practically free from any chance of bending, or buckling, due to the ductility of the metal of which they are composed. Modern storage battery makers have had to learn the lesson



Fig. 3. Diagram to Illustrate the Locking Action of the Grids Used in Oxide Batteries.

in the usual painful and expensive manner, and they have learnt it. It may not be amiss, however, to warn buyers against cheap batteries; pure metals, and carefully smelted lead antimony alloys are very much more expensive than impure metals, or carelessly arranged alloys.

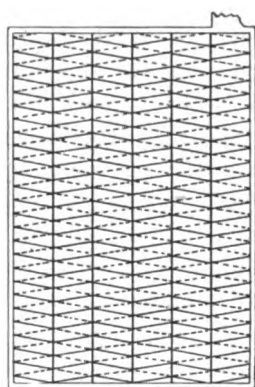
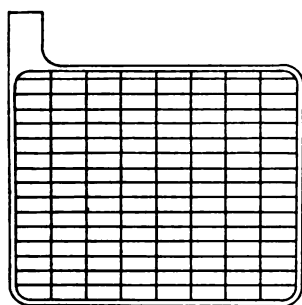
This again is one of the troubles that beset the battery in its early days; the importance of purity in all the materials of which the battery was composed was not appreciated, now it is. To take an illustration that may occur even today; suppose there is a little copper, or a little iron in the lead antimony alloy; in course of time a small galvanic battery will be set up between the iron, or the copper and the lead antimony; the electrical pressure of the little battery will be very small, and the current that it furnishes will be very small, but as it is constantly at work, it will gradually eat a hole in the grid; at best it will weaken the grid very considerably, and lead to its very much earlier displacement.

As everyone knows, pure metals, and pure substances of all kinds are expensive, because of the successive purifying processes to which they are subject. Each succeeding purification costs more than its predecessor, though the percentage of impurity it throws out is often very much less. It will be everyone's experience that it is the last 5% of efficiency that is the most expensive.

The Titan

Another form of grid for which great things are claimed is shown in the illustration Fig. 2; it is called the Titan. The peculiar feature of it is that in place of the space containing the active materials being merely divided up by vertical and horizontal bars; a sort of web is formed, as will be seen from the illustration. Each plate is divided in section vertically, and each section is in the form of a parallelogram, with acute angles at the ends and obtuse angles in the middle.

The horizontal section is like two acute angled triangles with their bases together, it is claimed that this form



Two Conventional Forms of the Lead Grid. Fig. 1 at Left; Fig. 2 at Right.

forming the carriers are composed. Lead, it will be remembered, is a very ductile metal; it can be bent with great ease, and consequently the early lead storage batteries gave considerable trouble owing to the lead plates, the lead grids, etc., being bent out of the vertical, by the

holds the active material better than the other forms that have been described. In the Exide battery an important point is made of the fact that the active material is held in the grid, in the form of vertical strips between vertical grid bars, and locked in place by horizontal surface ribs, which are staggered on opposite sides of the plate, and which lock the plates in position very much in the same way as dovetailing. (See Fig. 3.)

The Arrangement of the Plates

In all storage batteries there is an odd number of plates in each cell; there may be three, five, seven, or any other odd number and the negative plates form the larger number. Thus with three plate cells there will be two negative plates, and one positive; with five plate cells, three negatives and two positives, and so on. The object of this arrangement is that there shall be a negative surface opposite each surface of each positive plate.

There are two negative surfaces exposed one at each end of each cell, as will be seen from the illustrations; 4 and 5; these surfaces do not take much part in the operation, though the outside negative grid as a whole assist in conducting the current. The positive and negative plates are each connected together by a special form of junction piece, as shown in Figs. 6 and 7. Great care has to be taken in making the connections between each individual plate, each positive, or each negative plate, and its junction piece.

The junction is always made by burning, practically welding the whole together. The metal of course runs very easily, responds very readily to heat, and the burning of the connections is not difficult. It has to be carried out by skilled men, because cleanliness, as in all electrical matters is of such importance.

Each plate, each grid is cast with a lug at the top, as

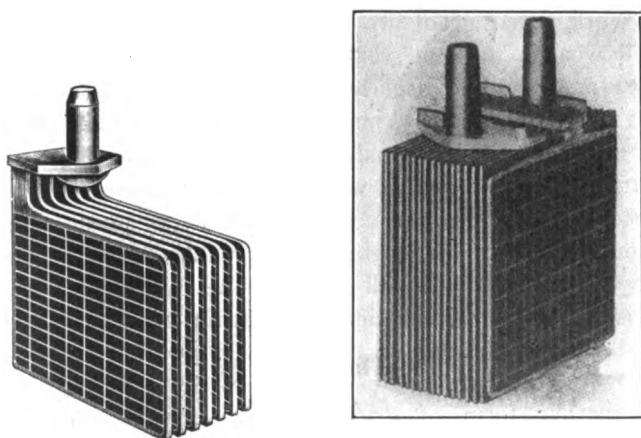


Fig. 4 at Left; A Negative Group of Plates; Fig. 5 at Right; The Positive and Negative Plates Assembled, Ready for the Cell.

well as the feet at the bottom when feet are used; when in place the plates all stand vertically, resting on their feet, the lugs cast at the bottom of the grids for the purpose, or else rest in the cells, the plates themselves as explained, being well above the bottom of the cell. The lugs of the positive plates are burnt to a bar junction piece as shown, which stands outside of the jar and clear of it on one side, and the negatives are burnt to

their junction bar which stands clear on the opposite side.

The object of this arrangement is to make sure that there shall be no chance of a connection between the positive and negative junction bars. Such a connection may easily be formed by carelessness; a small piece of copper wire for instance, carelessly allowed to rest on the positive and negative junction bars would form a path for the current outside the cell, and would discharge the cell in a comparatively short time.

Similarly moisture and dirt on the top of the cover of the cell might form a connection between the positive and negative bars, and though it would be of high resistance, the path being always closed, the leakage current that would flow through it would gradually discharge the cell.

A point to be very carefully watched in connection with all storage batteries is, the prevention of leakage

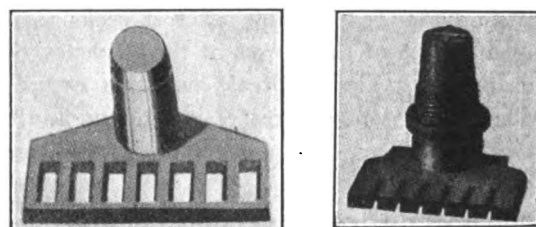


Fig. 6 at Left; 7 at Right. Two Forms of Plate Connectors.

currents, by the formation of leakage paths between the positive and negative bars, or terminals; merely a deposit of moisture on the cover form a path, and a more serious one and one that is rather readily formed, is by means of a deposit of moisture on the top of the cell and on the sides leading to the bottom of the box in which the cell is contained.

With all wet batteries there is always a danger of a leakage current discharging the battery due to the formation of these moisture leakage paths. Perhaps an instance that frequently occurred in the writer's experience with wet primary batteries will illustrate the point. Wet LeClanche cells were usually formed of either glass jars, or earthenware, the salammoniac solution about reaching two-thirds up the jar; the whole of the jars of a battery, sometimes numbering as many as 20 would stand in a wooden box. In many cases the only place available for the battery box was in some warm position; the liquid used to evaporate, not only the water but the salts held in solution, and recondensed on the outside of the glass or earthenware jars, a deposit being formed of salammoniac, a very thin coating.

Gradually this thin coating, about the thickness of ordinary writing paper, would extend to the bottom of the battery outside the jars, and the deposit was continued on the bottom of the box. Two things happened, the jars were gradually emptied of solution, and a leakage path was set up between the cells, by means of which a current was able to flow, and the cells work down in a very much shorter time than they ought to have done.

The writer has known batteries that should have run without attention for at least 12 months, requiring almost

complete renewal in about 3 months. The peculiar feature was, inside the thin layers of salammoniac on the outsides of the jars there were capillary spaces, and as soon as the deposit reached a certain distance down the outsides of the jars, syphons were formed, the long legs of the syphons being on the outside, and the liquid gradually found its way up the insides of the jars and down the outsides and emptied them.

This leakage path the writer found exceedingly interesting, and he describes it because such a path may be formed between any two cells of any battery if the conditions are favourable. When the liquid reached the bottom of the box and extended from cell to cell, there was a battery formed between each pair of cells outside the jars; it consisted of the carbon plate with the oxide of manganese in one cell, the liquid between it and the jar in that cell, the liquid in the two syphons of two adjacent jars and the liquid on the bottom of the box. As there was generally a connection between the carbon plate of one cell and the zinc plate of the next, there was a closed circuit for this battery formed on the outsides of the jars; the condition was the same as if a fine wire of considerable length had been connected across the zinc and carbon plates inside the cell. The internal electrical resistance of this secondary battery as it may be termed was very high, but its circuit was closed for the whole 24 hours of each day, while even a hard worked battery would only be in use about a minute at a time, and hardly an hour altogether under ordinary working conditions.

Under ordinary conditions also, the battery had time to recuperate between each current it supplied, while with the secondary box battery, there was no intermission, and the main battery had no chance of picking up.

Exactly the same set of conditions may arise with a battery of storage cells, if a deposit is allowed to form as explained above, on the tops of the cells, on their sides, and on the bottom of the box; this will again be a sort of secondary storage battery, whose circuit is always close, and the effect upon the useful life of the battery itself may be very serious indeed.

The Result of Carelessness

This condition of things can only arise from carelessness. When the batteries are being charged, there is a condition known as gassing; when the charge is complete hydrogen and oxygen gases come away freely as long as the charging current is flowing through the storage cells after gassing has commenced, the ebullition of the gas carries away minute quantities of the liquid itself just as steam in a steam boiler carries into the steam space minute quantities of the water from which it is formed.

In modern storage batteries careful provision is made to trap any liquid that is trying to get away, and to carry it back into the body of the liquid in the cell; carelessness in looking after the electrolyte and the stoppers that are now provided may allow some of the liquid to pass out of the cells during gassing, and to be condensed on the

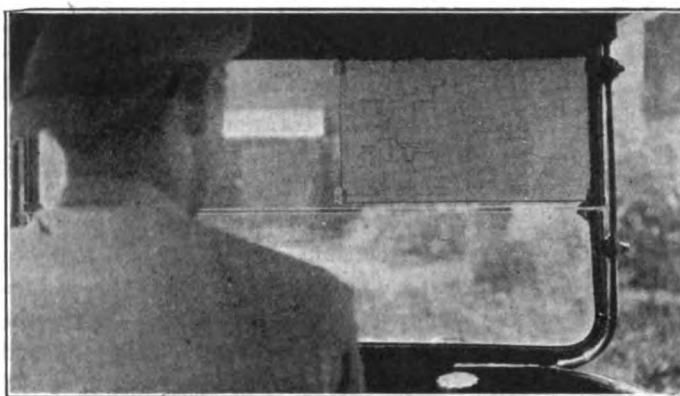
outsides of the cells, in very much the same manner as with the Le Clanche cell described above. One rule that should always be observed in connection with storage batteries is, keep them dry and clean, on the outside; also see that the battery box is kept dry and clean. This applies equally to the Edison battery.



ROAD MAP ON WINDSHIELD AIDS TOURIST

By Dale R. Van Horn

THE next time you have a long, hard drive to make, get a clear, accurate map of your route, and attach



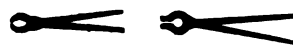
A Handy Place for the Road Map.

it with stickers to the upper half of the right hand side of the windshield.

With it always before you, pointing the way, you will not be very apt to get off on the wrong trail.

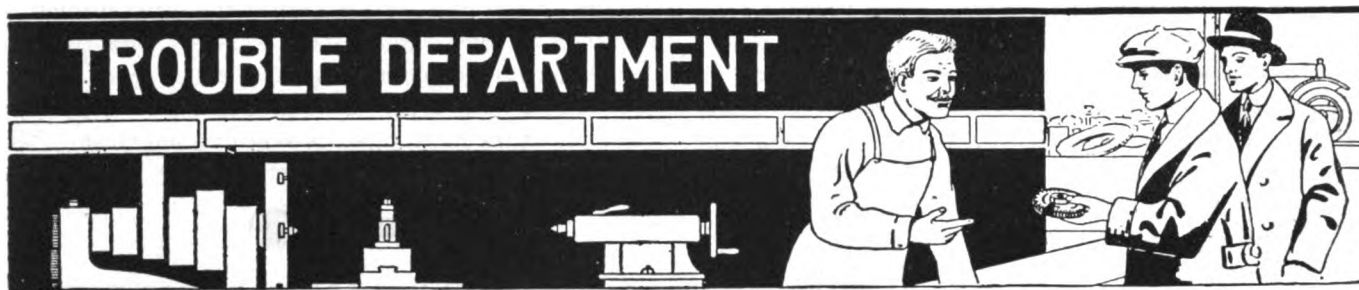
If you have been over the road before and can recall certain landmarks, it will be well to jot these down in large, black lettering. If the map is of large scale the location of churches, school houses and bridges can be shown accurately and will help when making the drive.

This plan beats the occasional stopping for map consultation.



TIRE production in 1914 appropriated five tires per car. In 1922 it will appropriate three and one-half tires. This means that a production of 33,000,000 tires in 1922 will be sufficient to take care of the present ten million car registration in the United States. In 1914, 8,000,000 tires were required for a million and a quarter cars. Miller tire men account for this difference in the number of tires required per car by the long mileage obtained in the increasing use of cord tires.

Each year, according to The Miller Rubber Company, tire sales are becoming less seasonable. One out of every five cars produced is now a closed model. Open roads in the winter make it unnecessary for motorists to lay up their cars. More tires are worn out in August than in any other single month. July and September come second and third. June next, then October, followed by May and November. April, December, March, February, and January each follow in order of importance.



Crankshaft Repairs

From H. W. Bennett, New York: In your April issue I was interested to find an article relative to cylinder wear. I have done some cylinder repair work and have found, what I believe to be the cause of wear at the front and back of the cylinders.

In many of the engines which I have repaired and in which this uneven wear was encountered I have found the babbitt lining or the bronze backings of the linings badly worn on the ends, permitting end play in the connecting rods. In other engines I have found the journal bearings to be worn in the same way.

In the first case the connecting rods, and the pistons are free to move endwise in the cylinders. When the engine is running in an inclined position, going up and down hills, the weight of the piston and connecting rod naturally bears against the cylinder wall and the wear is unevenly distributed. It might be said that an engine seldom, if ever, runs in a level position.

If the rods were tight on the crank shaft and the latter unit were free to shuck forward and back, then the whole weight of the flywheel, crankshaft and connecting rod assembly would rest upon the cylinder wall on up or down grades.

In our shop we find that an excellent method of repair in such cases is first to have the cylinders reground and new pistons and rings fitted and then to act as follows.

Make up the crankshaft-connecting rod-piston assembly with the connecting rod bearings fairly tight, but not so tight as to cause much friction. Or, to state the matter in another way, a running fit without any bearing play.

Clamp the crankshaft in the block with an old bearing cap, loose enough so that it is free to work back and forth. Revolve the shaft a number of times so that it will find its own position on its bearings and then fit the journal or main bearings after the old bearing cap has been screwed down tightly to hold it in place. The main bearings should be fitted in such a way that the shaft is held in this position. I should like your opinion upon this process.

I should have stated that the engine block is upside down during the fitting operation so that the crankshaft rests upon the tops of the main bearings.

Reply: It seems to us that your ideas along the lines of "oval cylinders" are fairly true and your method of centering the crankshaft is excellent.

There is much more to be said on this subject, however. A cone clutch engine, for instance, will have a tendency to

work the crankshaft forward. A few of the multiple disc clutch engines have a strong spring which forces the crankshaft forward as well. With the average engine, however, your theory is probably correct since most designers try to remove all possible end thrust from the shaft. Helical cut gears for timing tend to push the shaft back somewhat, in some instances.

The Marion 1914 Car

3126

From P. E. Cerutti, Missouri: I have a Marion 1914 model 37A four cylinder car, equipped with a Continental motor, Westinghouse starter, Splittorf magneto model 40, Autolite Generator No. 3730-D.

A local man who worked on the car says that the storage battery must be supplemented by six dry cells for ignition purposes. If this is so, what is the reason and what can be done to do away with them?

Please give me the valve timing for this engine.

Reply: In answer to your question relative to a White motor. We have no records which show the timing of this machine but you will have no trouble in timing it properly if you follow our directions.

You must first find the firing order. Remove one of the timing gears so that you can turn the cam-shaft freely. Remember that the cam shaft normally turns opposite to the hands of a clock. Turn the cam shaft in the direction that it normally runs, or counter-clockwise as it is termed, and watch the exhaust valves. The exhaust valves open in the firing order.

Suppose, for instance, the firing order were 1-3-4-2. Then number one exhaust valve would open, then number three, then number four and finally number two. Having found the firing order turn the engine over until the piston in number one cylinder is at the top of its stroke and starts downward, let the piston travel downward for 1-32 of an inch, then stop turning. At this point the exhaust valve in that cylinder should close. It is extremely difficult to set the exhaust valve properly except by the following method:

Place a piece of thin, stiff paper (this paper will do perfectly) between the tappet and valve stem (exhaust) of number one cylinder and turn the camshaft in its proper direction until exhaust valve number one opens and starts to close. Now watch that valve and give the paper a gentle pull. Keep turning the camshaft until the paper is released and can be slipped out. At this

point put on the timing gear so that it meshes with the other timing gear and the valves are timed.

Still keeping the piston where it was originally set remove the cam on the ignition unit. Or if it is a magneto, uncouple the magneto drive shaft from the engine so you can turn it. As you turn the cam or the drive shaft of the magneto you will notice that a set of breaker points in the ignition box come together and then separate. Be sure to turn the cam in the direction which it normally turns when the engine is running.

Slowly turn the cam until you see that the breaker points are just about to separate. (Assuming that you have retarded the spark lever on the steering wheel.) At this point set the cam or couple up the magneto shaft as the case may be.

Now if you have followed these directions properly you will have the following conditions: Piston number one has started down on its intake stroke 1-32 of an inch; the exhaust valve in number one cylinder is just closed. Then cylinder number four is ready to be fired. So look in the distributor box and find under which terminal the distributor brush comes and contact that terminal with number four spark plug.

Connect the other terminals with the other plugs in the proper firing order and the engine is properly timed.

Wiring of Buick 1918

3127

From E. Browning, Pennsylvania:—Will you kindly publish a diagram of the wiring used on the Buick 1918 six cylinder car model E 46, equipped with the Delco system.

Reply:—The wiring diagram you request is printed on this page.

Timing of White Motor

3128

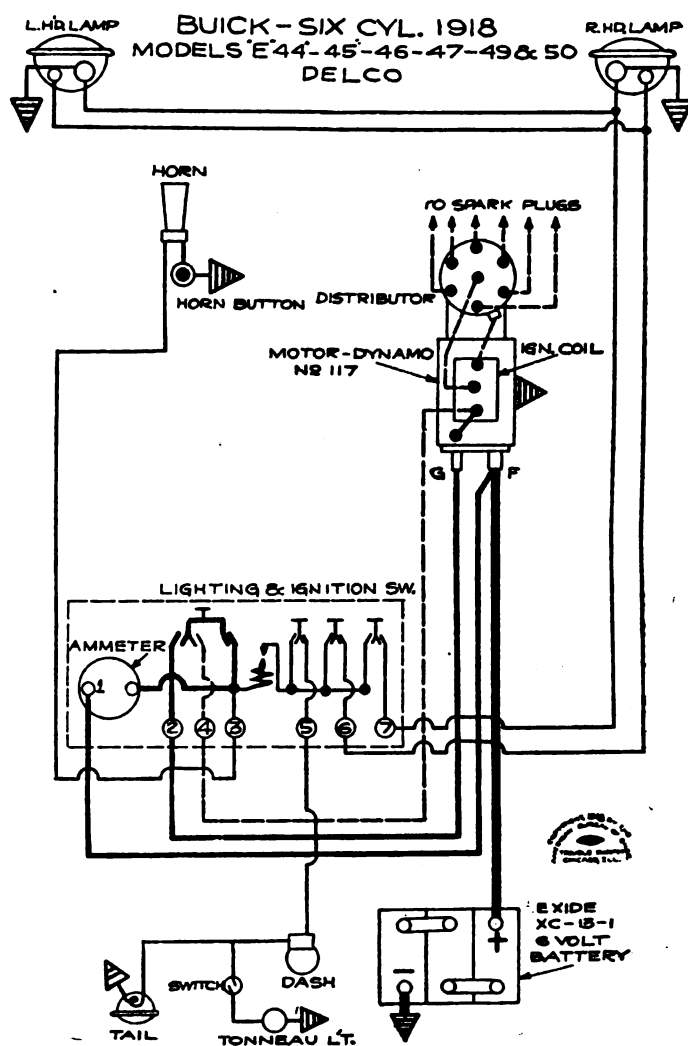
From L. Anda, New York: I am overhauling a sixteen valve, four cylinder White motor. When I received this motor it was all apart, and in order to re-assemble it, I should like to have you publish the correct timing of this motor.

Reply: The Marion 1914 car is the skeleton in our closet and about every two months one rattles its bones and sends shivers up and down our spine. Now if you would only ask us about a 1914 Cadillac, or for an inside wiring diagram of the 3rd pyramid we might be able to give you help. We could tell you how to cure hay fever, scare off mosquitoes or even help you with a mild case of spring fever; but when you ask us about that 1914 Marion car you are tapping a dry well because we haven't a single true record of that car.

We have wiring diagrams aplenty of the machine—in fact we have too many, and they are all different. About the time we really locate the correct diagram another reader comes along and asks us about his Marion

with an entirely different system. And so we are in a position of knowing so much that we know nothing.

Nevertheless we think that we can answer your questions with a fair degree of satisfaction. First, as to the need of dry cells in addition to the storage battery. The storage battery and generator system is grounded so that the current passes in a certain direction. However the magneto is grounded in the opposite direction. If the storage battery were connected with the magneto it would either short circuit the battery or de-polarize the magneto. We know of absolutely no way that you can obviate the use of the dry cells for ignition in starting the car.



We do not have the valve timing of this machine but you can easily work it out for yourself. Set the exhaust valve to close 5 degrees after dead top center and you will be about right.

To do this, take off the timing gear and turn the piston until it is at top-dead center, number one cylinder. You can determine this by putting a stick into the spark plug hole so it rests upon the piston and by rocking the fly-wheel back and forth see when the stick is at its highest point. Then move the crank shaft forward so that the piston is 1-32 of an inch down on its stroke. Leave the piston in this position.

Put a piece of stiff paper between the number one exhaust valve stem and tappet and turn the camshaft in the direction which it rotates normally (counter clockwise). Turn the camshaft until the exhaust valve opens and then starts to close. Keep turning, slowly, until you can pull the paper out, thus showing that the valve has closed. Then mesh the timing gears.

Under these conditions the exhaust valve will close slightly after top center on the intake stroke. The rest of the valves will take care of themselves.

Essex 1920 Wiring

3129

From George Green, Oklahoma:—The wiring on my Essex Model A 1920 car equipped with the Delco system has been giving me considerable trouble. I should appreciate it if you would publish a diagram of the wiring used on this car.

Reply:—We print below the wiring diagram you request.

Owing to a mistake on the part of our printers, the question and answer below were only printed in part in our June issue, and we are therefore re-printing them in their entirety in this number.

Overheating of Chevrolet 1918

3130

From C. W. Mueller, New Jersey: Can you tell me what the cause is of the overheating of my 1918 Chevrolet F. A. model which I recently overhauled?

I put in oversize valve stems, reseated and reground the valves, scraped in the bearings, etc.

The water jacket and radiator are clean and the pump works freely. Since I overhauled the engine I have re-adjusted the valves by moving the camshaft gear ahead one tooth but it doesn't show any improvement.

I shall appreciate any help you may be able to give me.

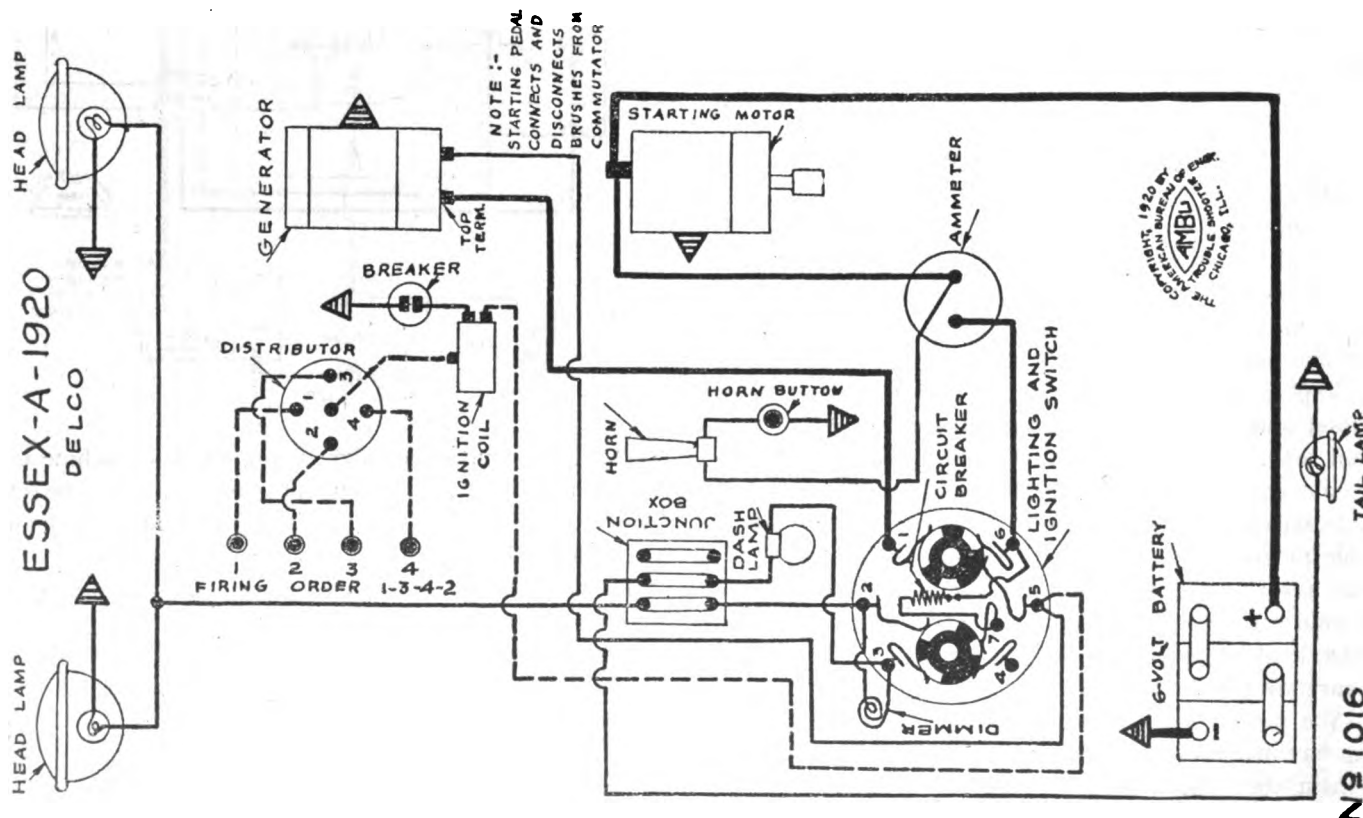
Reply: You should have practically no trouble from overheating with this machine if all of the parts are clean and the fan belt is tight enough to operate the fan.

We are inclined to believe that you have advanced the cam shaft too far ahead and we would advise you to check up on the timing of the engine. The exhaust valve should close after the piston has started downward on the intake stroke and the faster the engine the later the exhaust valves should close.

The reason for this is that the hot gas will continue to expand and rush out after the piston has gone to its extreme top and should you open the intake valve too soon, a lot of the exhaust gas will be pocketed in the engine and not only cause loss of power, but cause overheating as well.

If, after checking over the timing you find that the engine still overheats, we would advise you to wash out the cooling system with a strong solution of washing soda and water. Examine the hose connections and see that they are clean. Scrape out the water jackets and turn some of the water through the radiator from inside the hood so as to clean the mud and dirt out of the air places.

If you still have trouble please let us know, but we think that if you follow our directions carefully, you will cure the trouble.



Water Leaks Into Cylinder

3131

From W. E. Macdonald, New York: I would like to have you tell me what may be the reason for trouble with my Studebaker Six car. When the car is allowed to stand for any length of time, water will collect in the second cylinder to the extent of from one to two quarts.

At first I thought that the gasket might be at fault, so I installed a new one, but the trouble still exists. I have examined the cylinder walls and cannot find any leak.

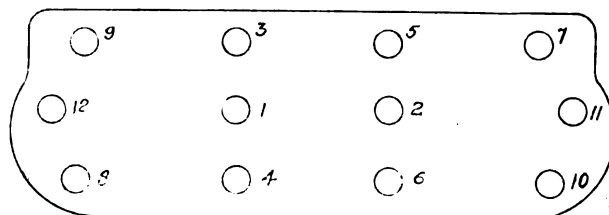
Reply: There must be some trouble either with the gasket, the cylinder top surface or the surface of the head. How do you prepare the gasket for the engine? Are you sure that you are tightening the cylinder head bolts properly? These are two vitally important things to do properly.

In the first place you should clean off the two surfaces, the one on top of the cylinder block and the one on the head. Rub them with gasoline until no grease or pieces of dirt remain. Then take a straight edged piece of steel or a steel rule and go over every fraction of an inch of the surfaces around cylinder number two, the idea be-

ing to see that the surface is perfectly flat with the rest of the block. You may find that the head is warped just enough so that it will not squeeze down upon the gasket. Look for scratches, etc., on the metal surfaces.

If everything is all right as far as you can see, then there must be some way to make the cylinder tight. Mix up about two spoonfuls of flake graphite with just enough cylinder oil to make it into a paste. The paste should spread just like butter. Coat the surface of the block and head with this stuff and put together. The graphite will help to plug up any scratches, etc., and to make a tight joint. The graphite will also lubricate the face of the gasket so that it will slip into the inequalities of the iron much better. Graphite mixed in this way is about a hundred times better than shellac.

In tightening the nuts be careful to follow these directions. First tighten all of the nuts until they fit firmly down upon the head. Usually you can do this with the fingers. Then give each nut one-half a turn in the order shown below. Start with number one and follow in the



The order in which the nuts should be tightened.

order shown. Maybe there are more nuts than shown, or possibly less, but you will find that the idea is to tighten the whole head down evenly; first the center, then the ends, then between the ends and the center, etc.

When this is done start with number one and give it a half turn. Go all around again. Toward the end you will find that you cannot turn all the nuts equally, but this cannot be helped. Finally tighten those bolts around cylinder two and finish up with those around the other cylinders.

Wiring of Overland 1920

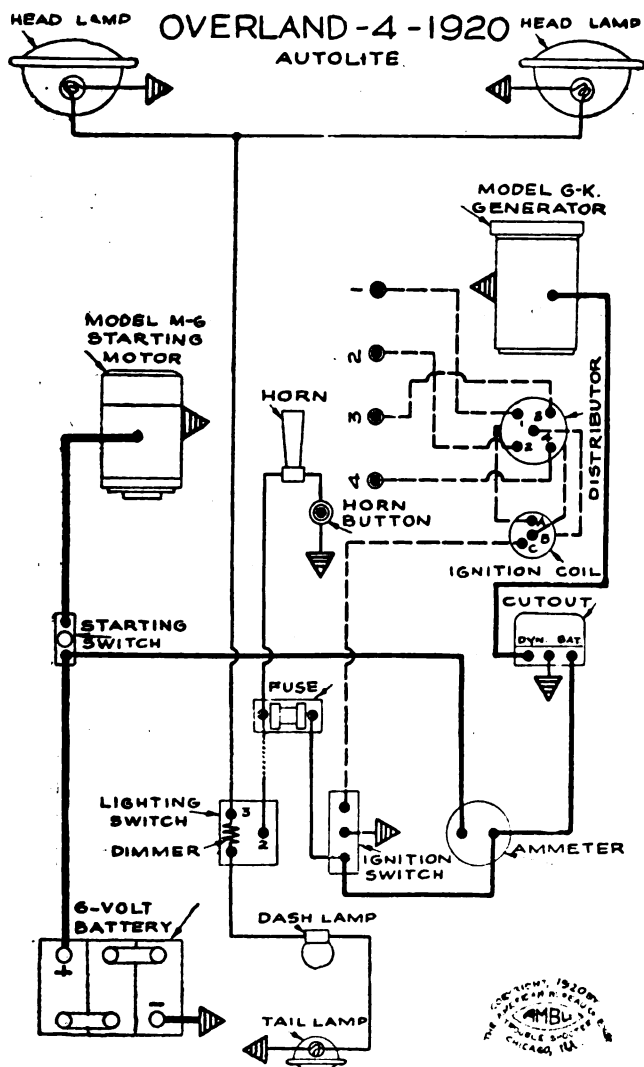
3132

From O. T. Freeman, Maryland:—Will you please publish the wiring diagram of the Overland model 4 1920, equipped with the Autolite system.

Reply:—This diagram is printed on this page.

HIS LAST MARCH

From the laconic United Press: "Mr. F. S. D—, Cedar Rapids, Ia., passing through this city last night, en route on an automobile tour, lit a match to see if his gas tank was empty. It was not. Age 47. Cedar Rapids papers please copy."—*Chicago Tribune*.



No 3040



Probably Timer Trouble

From E. A. Kopp, New York: I have a 1914 Ford with which I am having trouble but I am unable to locate it. When I am driving under twenty miles an hour, the car will lag and jump, so to speak, but when going over twenty miles an hour it appears to work perfectly.

I have tested the ignition, valve springs, transmission, commutator, vibrating coils on the dashboard and have found them all O. K.

Is it possible that the carburetor is at fault? I shall appreciate any help you can give me.

Reply: It is possible that your trouble is located in the carburetor, but the writer is inclined to believe that you have overlooked one vital point in the ignition system, the timer. There is absolutely no way to test the Ford timer with any degree of satisfaction.

Suppose, for instance, the timer arm spring were very weak and the contacts and fibre were just a bit rough. When the timer is quiet the arm will usually make a good contact, but when the arm is running it will jump away from the contacts. At high speeds the centrifugal action will throw the arm against the contacts and the engine will run smoothly. This is exactly your trouble, so examine the spring.

Your trouble would exist were the timer roller loose on the arm or the arm loose on the shaft, or the roller uneven. We would advise you to clean the timer and try it running dry; then try it oiled with Three-in-one oil; then try a new timer. If you still have trouble you might try various spark plug adjustments.

Clean the carburetor and see that the needle valve is smooth and has a sharp point.

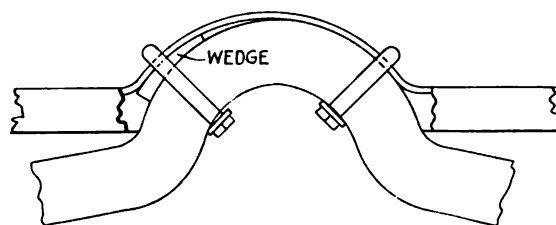
Uneven Spring Suspension

From Geo. Baier, New York: I have a Model 1920 Ford sedan which hangs over to the left. This machine is fitted with a set of Hassler shock absorbers. I also know of another car which hangs the same way. I have tried various adjustments of the spring-chassis clamps but nothing seems to remedy the trouble. The spring tie bolt is in the middle.

Reply: Either the frame member is bent, the spring on one side is not tempered enough, or the spring itself

is bent. A new frame member or new spring might cost considerable and until you are certain that the trouble is not merely due to loss of temper in the spring, we would advise you to adopt the following method of repair.

You will find that the curve of the spring conforms



Method of placing and fitting the wedge.

somewhat with the curve of the frame but that the curve of the frame is such that it is impractical to swing the spring to one side as might be possible were the two parts more nearly a circle.

For this reason as well as due to the fact that the spring bolt should be at the center of the frame, it is best to throw the frame off its balance upon the spring.

Loosen the left frame-spring shackle and jack the frame up until it is even with the floor. Make a heavy oak or walnut wedge to fit between the frame and spring at the frame-spring shackle and drive it into place. A staple around the clamp will hold the wedge in place.

The sketch accompanying this article clearly shows how the wedge should be placed and fitted. Due allowance should be made for the piece of leather which normally lies between the spring and the frame. This leather may remain as it is or cut in half so as to protect the right side only but at any rate metal should not come against metal or the shrieks from the rear will be hair raising.

CIRCUMSTANTIAL EVIDENCE

The Bingville selectmen had held many sessions and formulated a set of auto laws that was the pride of the county. So the constable felt no worry when he stopped a motorist.

"Ye're pinched for violatin' the auto laws," he pronounced.

"Which one?" inquired the traveler.

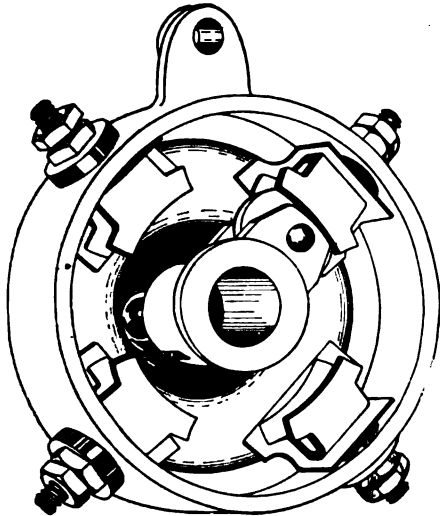
"Durned if I know, but ye certainly hain't come all the way down Main Street without bustin' one of 'em."—*American Legion Weekly*.

Special Ford Accessories

The Colestock Timer

A wipe joint, for electrical connections, is always a clean joint. This statement may seem somewhat unnecessary, but when it is considered that few manufacturers have taken advantage of this fact, in designing Ford timers, it is evident that not everyone knows its importance.

The Colestock Mfg. Co. of 2901 Montrose Ave., Chicago, Ill., is one manufacturer

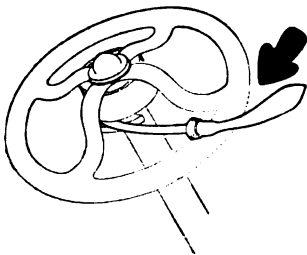


who has really produced a wipe joint timer for a Ford car. The Colestock timer consists of a metal housing which carries the four electrodes, and the center revolving brush which is merely a roller mounted on a fitting over the camshaft.

In action the center roller wipes between the four electrodes and makes an electrical perfect connection. The connection might be likened to that made by a knife switch. Our Ford owner readers will do well to investigate this timer.

Hughes Spark and Gas Lever Extension

A Ford convenience is offered in the Hughes spark and gas lever extension, which device clamps to the regular levers,



extending them to a more convenient position just under the steering wheel rim and in easiest finger reach. The installation is very simple, the device being held by two set screws. This is an addition to the Hughes line of extensions which includes also the M. & H. gear shift extension and Ford Brake handle extension, all manufactured by the M. & H. Novelty Co. 1466 West 28 St. Los Angeles.

The New Remy Lock for Fords

The new Remy Transmission Lock for Fords, just placed on the market by the Hercules Manufacturing Company, Indianapolis, is said to give Ford users the same complete and positive protection against car thieves as enjoyed by owners of high priced automobiles. It takes the place of the regular transmission cover and it is claimed absolutely prevents the motor being turned over by the electric starter, by hand or its own power.

Its installation and operation do not in any way change the design or mechanism of the Ford, yet the lock permits the car to be moved and steered by hand in case of a fire or other emergency.

This new lock is scientifically designed, carefully and sturdily made and the manufacturers state that it has baffled all attempts of experts to defeat its purpose, and has been given a Class "A" rating by the Underwriters' Laboratories. It fits snugly into the top of the Ford transmission case and is installed by merely screwing it on in the place of the original cover. The lock proper is encased in a hardened steel sleeve and covered by a tight-fitting snap lid—which makes it dust proof. When installed, the lock lid comes just above the floor board near the brake pedal and thus is easily reached from the driver's seat.

The car is locked by giving the key a quarter turn, thus causing the teeth of a steel forging to project into the ring gear of the fly wheel, which completely prevents the power plant being turned over. The locking operation also causes a malleable iron arm to extend under the edges of the transmission case opening, thus making it impossible to remove the lock, even with the fastening screws taken out. The main locking arm is held securely in the unlocked position and cannot engage the ring gear unless the proper key is used.

The lock may be installed in a few minutes and no special tools are required.

Dealers should write to the manufacturers for information as to the liberal trade discounts.

Grant Extension Pedals

The Grant Auto Appliance Co. of 315 S. Clinton St., Chicago, Ill. is marketing an interesting specialty for Ford cars, known as the Grant Surety Extension Pedal. This pedal is designed to clamp upon the regular Ford clutch, reverse, and brake pedals and is so made that it extends considerably beyond the side of both the clutch and brake pedals thus giving a firm grip for the foot. A projection at the side prevents the foot from slipping off.

The pedals are made from the highest grade of materials and the makers claim that they will give satisfactory and lasting service. We understand that this company makes pedals for other makes of cars as well as for the Ford.

New Era Prices Lowered

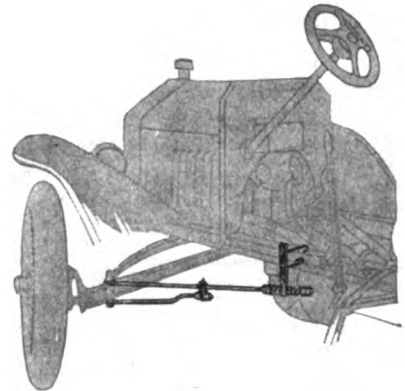
New prices and discounts on springs, tire carriers, spring bumpers and visors recently announced by the New Era Spring & Specialty Company of Grand Rapids, Michigan, shows a downward trend in price revision and an upward trend in discounts.

"Common Sense" Radius Rods

"Common Sense" Radius Rods, a patented adjustable unit for replacing regular rods on Ford Cars and Trucks have been placed on the market by The Silver Mfg. Co., of Salem, O.

The new rods, which the makers say will add strength, safety and driving comfort to the Ford Car, are fastened securely to the frame on each side of the car and anchored firmly to the front axle above and below.

The strong construction takes all strain off the crank case. Through the adjust-



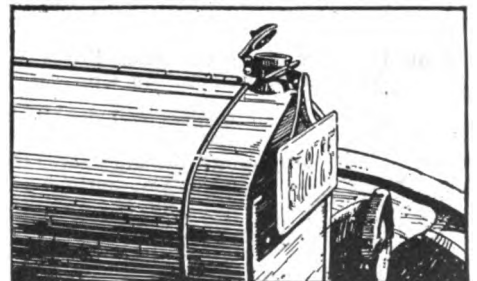
ment feature perfect alignment of front wheels is said to be always assured. The proper rigidity to withstand severe thrusts and at the same time give flexibility and resilience, is attained by strong springs held in place by adjustable nuts.

♦"Common Sense" Rods are said to prevent back-crawling of axles which makes so many cars steer hard. It is claimed that they enable the Ford to hold the road like a big car and to turn sharply without fear that the steering gear will jack-knife or the wheels buckle.

New Ford Combination Radiator Cap and License Bracket

"Cap-Brac" is the name of the new combination Ford Radiator Cap and License Bracket that is now appearing on the national automotive market.

The License Bracket holds the plate in the logical place—above and out of the



way of the crank handle. It complies with all State and County laws which require that the license plate must not be obstructed in any way.

The Cap-Brac is handsomely finished in nickel and enamel, lending a touch of distinction to a Ford's appearance. It is easily and securely clamped around the filler tube of the radiator in a minute.

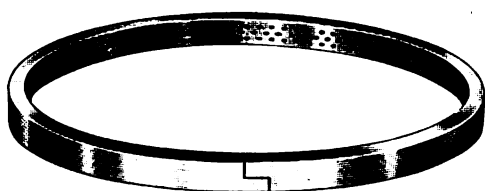
It is manufactured by Cap-Brac Mfg. Co., 1231 So. Figueroa, Los Angeles.

New and Useful Automobile Accessories

"Bear-Tite" Piston Rings

Bear-Tite Piston Rings after being adopted as standard equipment by a number of manufacturers of the highest grade cars and used by them for the past several years with unvarying success, are now being introduced to the car owner. This ring is the result of careful development covering several years of exhaustive tests, not only of rings of the manufacturer's construction but of other makes purchased in the open market.

These experiments coupled with the



experience they have gained in having cast as many as two million individually cast piston rings per month, has enabled them to turn out in Bear-Tite Rings a product of the highest merit.

Bear-Tite Rings, which are patented, are manufactured complete from the raw material to the finished state in Foster, Merriam & Co's plant at Meriden, Connecticut. Their foundry and machining departments are looked upon by the trade in general as one of the most modern in the automotive industry. Special and costly machinery has been designed and built right in their own plant, embodying labor saving devices and the most up-to-date methods of manufacturing their product to the closest limits of accuracy.

Bear-Tite Rings already have a large and increasing sale with the car manufacturer also with the jobbers and dealers and will undoubtedly be a determining factor in the piston ring industry in the near future. There is an excellent merchandising policy back of the ring whose reputation is backed by 87 years of experience.

John D. Carmody Joins Sales Force of Weaver Manufacturing Co.

A number of our readers will doubtless be interested in knowing that John D. Carmody has recently joined the sales force of the Weaver Manufacturing Co., Springfield, Illinois, manufacturers of the Weaver line of Garage and Shop Equipment. Mr. Carmody's territory includes Michigan, Indiana, Ohio and Kentucky, as well as the following cities:—Buffalo, N. Y., Pittsburgh, Johnstown, Erie and Oil City, Penna., Wheeling, Parkersburg, Huntington, Charleston, Clarksburg and Elkins, West Virginia.

Mr. Carmody is well known in the automotive industry, having been connected with the Champion Spark Plug Co. for a number of years and more recently with the Wainright Piston Ring Co., until its consolidation with the McQuay Norris Mfg. Co.

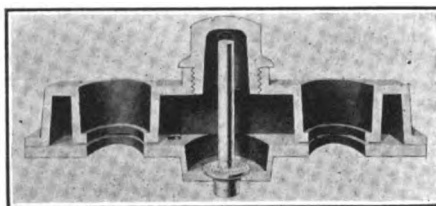
The Harsha Storage Battery

The Harsha Storage Battery Co. of 21 East Van Buren St., Chicago, Ill., is bringing out a battery which is said to be particularly adapted to heavy duty work.

Harsha battery plates are said to contain 50 percent excess of active material and are especially designed to stand enormous overloads. It is claimed that the battery will actually stand up, without damage, under a dead short circuit until completely discharged.

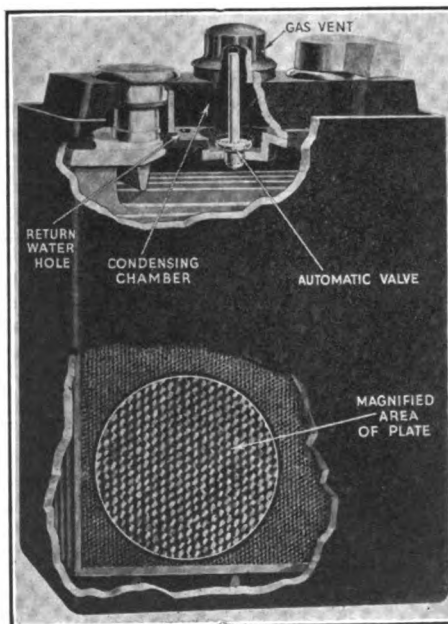
A feature of this battery is the condensing chamber. The loss of water and electrolyte is said to be obviated almost entirely by this construction, and cells will run a month without water renewal.

A compartment above the cells catches all of the gas and moisture which is released by pressure into the chamber through a flat faced valve over a large opening.



The moisture in the chamber is condensed and returned to the cell.

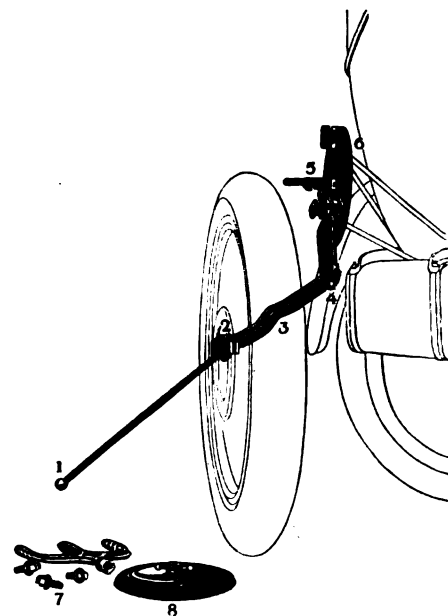
It is claimed that both the positive and negative plates are made of such hard ma-



terial that even after severe usage they can hardly be scratched with a knife and yet the porosity of the plates is such that a high discharge rate over a long period is possible. The power of recovery after a severe discharge is said to be remarkable.

The Lawrence Carrier

The lifting of a heavy disc wheel from and to the carrier on the back of the car is a man's sized job. Not only is it difficult



for anyone, but it is a clothes soiling procedure, one to be avoided if possible.

The Lawrence carrier, made by Lawrence Carrier Corporation, of 20 East Lake St., Chicago, Ill., is designed to fit upon any modern disc-wheel carrier. It can also be obtained for any cars equipped with demountable rims.

In using the device, to remove the spare wheel, it is only necessary to fit in the lifting arm, drop down the wheel and the job is done, almost at arm's length and with practically no effort.

The illustration accompanying this article shows a wheel in place ready to be lifted.

Jarosch Appointed Representative for F. & H. Ball Bearings

The F. & H. Ball Bearings which were used extensively by Motor Car Manufacturers in this country prior to the war, are again available, as the Jarosch Bearings Corporation of 1737 Broadway, New York, N. Y., has been appointed Sole Import Representatives for the United States and Canada by the F. & H. Factories.

The New York Company will maintain a complete stock of bearings in all standard sizes and types, and it is stated that immediate shipment can be made to manufacturers right from stock.

Mr. F. J. Jarosch is well known, having been connected with the Ball Bearing Industry in U. S. A. and abroad for the past 15 years.

The Jarosch Bearings Corporation has appointed the Ahlberg Bearing Company of Chicago, Ill., as Sole Retail Distributors for U. S. A. This company has branch stores in all the principal cities.

Cleveland Top Enlarges Line

The Cleveland Top & Specialty Company, East 65th & Carnegie, Cleveland, Ohio is concentrating on a line of top covers for all makes of cars, marketing under the name of Re Nu Top Recoverings, extending the scope of a business which formerly catered to Fords exclusively.

The Ford top cover or slip-roof outfit has been very thoroughly introduced and is used by thousands of repair men as a quick and economical method of replacing worn tops and also, to some extent, by the Ford owners themselves.

The Re Nu line is offered in the belief that there is just as big a field for top covers in other makes of cars as in Fords, and that a very large part of the top replacement business could as well be done by the regular repair man as by the trimmer. Naturally, it is difficult to stock a varied assortment of top covers. Hence, The Cleveland Top & Specialty Company is planning to give prompt attention by parcel post to order for special shipment. The Re Nu line also embraces complete tops for Fords including one-man tops and an allweather top of the California type.

All Re Nu products are given an unlimited guarantee of quality and fit.

Clear Sight Auto Visor

Every reader who has driven his car into the face of a glaring sun or toward a pair of glaring headlights will appreciate the Clear-Sight Auto-Visor which is being sold by the Popular Auto Novelty Mfg. Co. of 440 Liberty Ave., Brooklyn, N. Y.

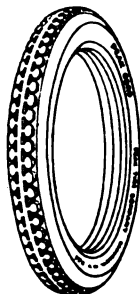
This device is designed for practically all of the standard automobiles, open and closed and is attached to the top of the windshield. It is made of Leatherette, black on the top and green underneath.

The fixtures upon which it is mounted are designed so that the angle may be altered to suit the wish of the driver.

Peak Cord Tires

The Peak Cord Tire Co., 1001 Bedford Ave., Brooklyn, New York guarantee all pneumatic automobile tires bearing their name and serial number to be free from imperfections in material and workmanship. This company manufactures an unusually fine line of tires which are well worth investigation.

They will keep all Peak cord tires and tubes in repair for a nominal price which is



paid in the form of insurance so that if the tire owner has in any way damaged or punctured the tires or tubes, the Peak Tire Company will attend to the repairs. This covers all accidents to their tires and tubes during the life of same, if they are still, in their opinion, in a repairable condition.

Snap-On Interchangeable Socket Wrenches

Someone has said that if the price of a complete set of really fine wrenches could be gotten down where people could afford to buy, there wouldn't be much trouble selling "kits" of tools instead of only one or two wrenches at a time.

The contention is a correct one, based upon experience being had with Snap-On



Interchangeable Socket Wrenches, according to the Motor Tool Specialty Co., of Chicago—exclusive distributors for this line.

"It was really a surprise to us," says Mr. Palmers of the Motor Tool Specialty Co., "how many mortorists want to own a set of wrenches that will fit and get to 99% of the nuts on their cars. Misfit wrenches—tools that never seem to help out much in



a road breakdown—are perpetually 'selling' their owner on the wisdom of investing in real wrench equipment.

"For the man who walks into a dealer's store with the idea of buying wrenches enough to do any job on his car, Snap-Ons appeal strongly. There—on the Snap-On display board which every dealer is given—are six different style handles, a universal joint, a ratchet and ten sockets. Any socket fits any handle. Either the universal joint or ratchet may be used in conjunction with any handle or any socket.

"The practical combinations he can get with two or three handles, an extension bar and a few sockets give him the *right* tool for every job.

"Of course the dealer makes more money by selling wrench kits instead of a single wrench today and maybe another next month."

Amazon Trebles Output

Officials of The Amazon Rubber Company, Akron, Ohio, announce that production is now running 85% of the total capacity of the plant, and orders are in hand to such extent that it is imperative to increase production to total capacity immediately.

Wicaco Twin Cut Piston Rings

During the past few years more and more attention has been turned toward the construction of piston rings, for the rings are the vital parts of an automobile engine.

The Wicaco Twin Cut piston rings, made by the Wicaco Screw and Machine Works, Inc. of Stenton Ave. and Loudon St. Philadelphia, Pa., are designed along the latest ideas of ring construction.

The Wicaco ring is of the step-cut type, but instead of a vertical cut for the slot, a diagonal cut is used. In other words the ring might be considered as being two diagonal cut rings in one. The lower part of the ring, on the face, is grooved for carrying oil. The construction of this groove is such that it wipes all oil from the face of the cylinders as it travels downward, yet lubricates the surface efficiently.

It is claimed that there is absolutely no chance for the escape of oil into the combustion chamber, provided the ring is properly fitted. These rings are ground to a perfect roundness and are made from close grained, resilient metal.

Dover Handy Oiler Set

If you are a repair man or machinist you will at once appreciate the new Dover handy oiler set which is being sold by the Dover Stamping and Mfg. Co. of 385 Putnam Ave., Cambridge 39, Mass.

This oiler set is something which the machinist trade has been in need of for many years for it is both a time and money saver. The set consists of six, ½ pint, copper-plated, steel oil cans and a heavy, black enamelled, steel shelf.

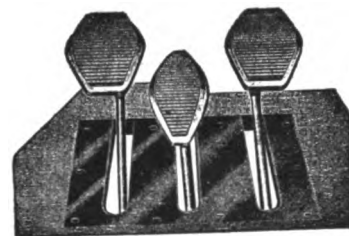
The oil cans are of the best grade with cut thread spouts and each can is marked with steel, raised letters, which indicate the contents of the can. The six cans are marked: "Gasoline," "Kerosene," "Machine Oil," "Neatsfoot Oil," "Kant Rust" and "Lard Oil."

The whole assembly is mounted upon a convenient spot in the garage or machine shop and the mechanic can select, without a moment's loss of time, the can which he needs.

Perfection Pedal Pads

The ordinary smooth pedals which are used for actuating the brake, the clutch and the accelerator on the automobile are slippery things, and because the foot is so prone to slip from them many accidents have been caused. Then again, in long drives the foot becomes tired from pressure upon an unyielding surface.

To obviate all of these disadvantages, the Auto Pedal Pad Co. of 318 West 52nd St.,



N. Y. City has designed a soft rubber pad, encased in a nicked steel frame.

Perfection Pedal Pads, as these pads are called, may be obtained for practically any shaped pedal on the market. The pads are fastened to the pedals by means of metal prongs, which are integral with the frame. The rubber faces are corrugated to form a soft, nonslipping surface.

Russell Taps and Dies

Every time you strip the thread from an automobile part you are practically touching a match to a dollar bill for it costs that much to have the thread put back and a new nut fitted. If you are unfortunate enough to strip the thread from a brake rod, the repair costs even more.

Every motorist should own a set of taps and dies and the larger the set, the more

the Height Gage Attachments. By attaching a rod of the proper length to the Micrometer any desired range from 3 inch to 32 inches can be obtained. The rod is inserted downward through the steel case-hardened base until the anvil finds the surface from which measurement is to be taken. A quick-clamping knurled nut, easily operated by the fingers, firmly holds the measuring rod in a perpendicular position.

Having a larger Base Area than many similar low-priced attachments, greater stability is insured. The reamed hole, which fits the sturdy measuring rod to a nicety, is also greater in size and depth. The upper end of the support, vertically split at right angles, is adjusted to afford a sliding friction as the rod is inserted and will tend to prevent side play should wear take place from constant use. It also holds the base and micrometer measuring rod intact when the tool is lifted from one surface to another, while its knurled exterior is convenient in handling.



money he can save, for as long as he owns an automobile he will find constant use for these tools. The repair man cannot do business without taps and dies and he will find it an economical investment to buy the units in sets.

The Russell Mfg. Co. of Greenfield, Mass. makes taps and dies of all kinds for automobile and machine work and they make a specialty of "automobile sets." The sets may be purchased in many sizes; the more commonly used dies and taps for the automobile owner and full sets for the repair man.

The set illustrated, No. B 108 1/2 consists of two die stocks, 15 and 23 inches long; two adjustable tap wrenches; a bit brace attachment for holding dies and a set of taps and dies covering both S. A. E. and U. S. standard threads from 1/4 to 3/4 inches.

Since 90 percent of all automobile threads are within the limits of these sizes (1/4 to 3/4 inch), the set is virtually complete.

Reed Inside Micrometer and Height Gage Attachments

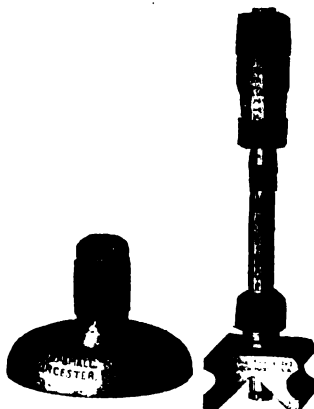
Reed Small Tool Works, Worcester, Mass., has recently developed an Inside Micrometer with a lower range than the former model.

This Micrometer, graduated to read to thousandths of an inch, has the usual half-inch run of spindle with measuring range from 2 inch to 32 inch. It embodies the unique sturdiness of the previous style of Reed Inside Micrometer and retains the regulation diameter of barrel, spindle and thimble, the extra large surfaces allowing for figures of generous size. The Rods, fitted with hardened tool steel anvils adjustable for wear, are interchangeable on the threaded stud at end of Micrometer Head and can be used in combination. A detachable handle is furnished and so arranged that the Micrometer can be used for right or left-handed work, a feature peculiar to the Reed.

The Standard Set packet in a pocket-size case consists of the Micrometer Head, an adjusting wrench, five rods and half-inch spacer, the capacity afforded being 2 inches to 7 inches. When five additional 5 inch Spacers are used the maximum range of 32 inches is secured. Thus the tool is capable of gaging the smallest automobile cylinder and will take care of the larger measurements in shop use.

The Inside Micrometer can be quickly transformed into a Height Gage by use of

Such a tool is useful in obtaining the height of projections from plane surfaces, the location of bushings in jigs, etc. It is particularly convenient on planer work which often requires measurements to be taken from the bottom of a groove to points above and for setting planer tools or the milling machine table. The V-shaped



groove in the bottom of the base adapts the tool for use in cylindrical work, measuring distances between shafts, for alignment purposes, etc.

The cut pictures show the combination of height gage alignment attachment with the inside micrometer, showing how a reliable



height gage is simply obtained, to serve where the purchase of a much more expensive tool would otherwise be required.

By inserting a .250 of an inch drill rod in the base and attaching any standard indicator, a surface gage is in readiness for use in straightening shafts or for checking variance in distance between surfaces. A surface gage scriber can be easily clamped to the rod, forming another handy tool.

The Reed Height Gage Round Base Attachment No. 7 differs from the Height Gage-Alignment Attachment No. 6 in construction and is intended mainly for height gage purposes.

Improved Runningboard Set

Automobilists the country over, who have appreciated the utility of an auxiliary supply of gasoline, oil and water, especially on long trips, but who hesitated to equip their cars with some of the sets in ordinary use on account of their rather unsightly appearance, will be greatly interested in the attractive automobile cabinet which is just being introduced by the Woolwine Metal Products Company of Los Angeles.

This cabinet, which is illustrated herewith, has been evolved from long experience in the manufacture of runningboard sets for automobiles. It is said to embody all of the practical advantages of the ordinary everyday set, combined with many entirely new features of great convenience to the motorist—better still, it presents an appearance that will harmonize with the appointments of the most luxurious car.

In this attractive cabinet set, the gasoline, oil and water canteens are inclosed in a handsome metal case of heavy steel, which is japanned and baked, and which will withstand all weather conditions. The cover of the box is hinged to the body, making the contents easily accessible. The whole outfit has been made absolutely noiseless and non-rattling by means of a heavy interlining and by equipping the handle of each canteen with a spring which holds it rigidly in place.

The canteens are of oblong shape, permitting a great saving in space—while the cabinet does not project beyond the runningboard. The canteens are equipped with special devices which greatly facilitate filling and emptying, making it possible to fill the canteens and to transfer oil, gaso-



line and water to the automobile easily and without dripping. All of the spouts when not in use telescope into the canteens, and are closed by mouth-pieces.

TESTING SPARK PLUGS

WHEN applying the screw driver test to spark plugs, note something besides the fact that they all spark on the outside. Note the length of the spark. Those cylinders where the spark will not jump more than one-thirty-second of an inch are not firing as strong as the ones that get a spark that snaps as you hold the screw driver an eighth away. You know how the spark plugs snap and crack at the exhibits at all the shows—you want to get as near that in your engine as you can.

The ignition current is like everything else—it follows the line of least resistance. Ordinarily, it is easier to jump a spark in the air than in the cylinder; contrari-wise, if the spark does not jump good and snappy out in the air, you know there is an easier place for it to jump somewhere between the terminal and the points inside. Many spark plugs "leak" when there is no visible indication of anything the matter and it is such a plug that produces the weak spark when it is short circuited on a lead that is known to be in proper shape.

WHEN ONE TON IS TWO TONS

Coal merchant (anxiously): "Hold on! That load hasn't been weighed. It looks to me a trifle large for a ton."

Driver: "T'ain't intended for a ton. It's two tons."

Coal Merchant: "All right. Go ahead.—*New Departure News.*"

PEAK CORD TIRES and TUBES

Pay for them *after* you sell them!

Here is a real opportunity for high-class tire dealers and distributors. A high-grade, black-and-white, Non-Skid Cord covered by an iron-clad 10,000-mile-adjustment Guarantee, that you can handle on *straight consignment!*

No investment—no risk—and a tire that's emphatically a *class* proposition, yet beats all competition in price and nets you a much bigger margin of profit! For full particulars address

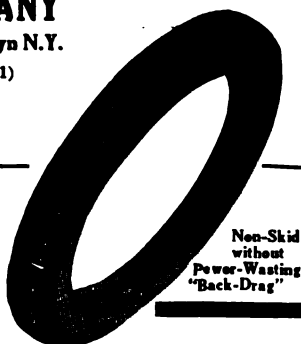
PEAK TIRE COMPANY

1001-1003 Bedford Ave., Brooklyn N.Y.

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*Motorists who know
"Speak for Peak"*

Covered by an Iron-clad 10,000-mile-adjustment guarantee!



Non-Skid
without
Power-Wasting
"Back-Drags"

SCREW PLATE SETS,

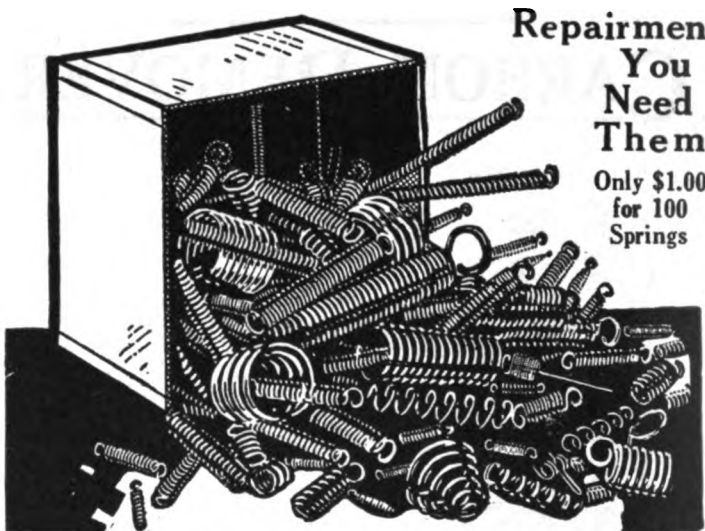


For garages and repair shops.

All sizes and styles.

Send for Catalogue.

**Russell Mfg. Co.,
Greenfield, Mass.**



**Repairmen
You
Need
Them**

**Only \$1.00
for 100
Springs**

Peck's Assorted Springs

are indispensable in every garage and repair shop. Every day or so you may need one or more spiral springs on some job. It's worth time and money to have this assortment right where you can pick out what you want.

**THERE ARE DOZENS OF PLACES
WHERE PECK SPRINGS FIT IN**

Brake repairs latch springs, choke valves, cutouts, carburetors, magnetos generators, etc.

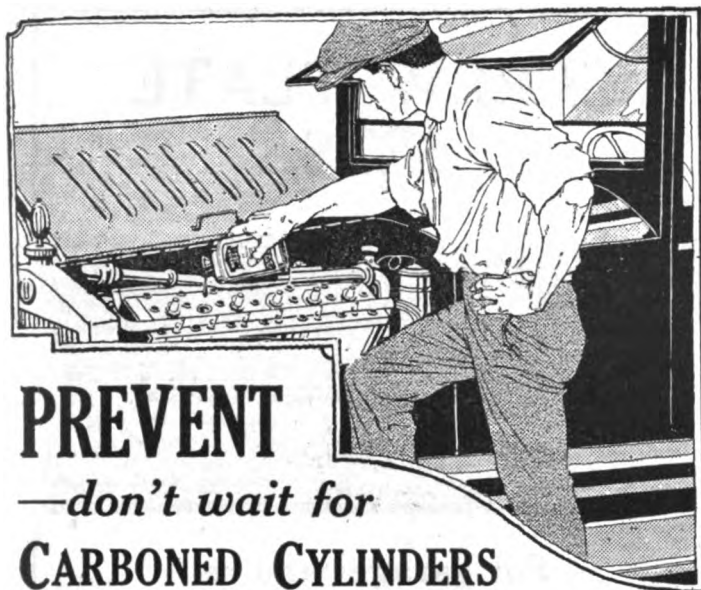
This assortment has over 100 brass and steel compression and extension springs in it. Sell four and you pay for the box.

Your own experience will give more "reasons why" you should stock Peck's Assorted Springs.

Send a dollar today with your order.

Prices Net to dealer
\$1.00 per box.
Jobbers: Write for
quantity discounts.
Send Your Order Now

THE PECK SPRING CO.
68 Broad St. Plainville, Conn.
Manufacturers of Coil Springs
for every purpose



PREVENT —don't wait for CARBONED CYLINDERS

DON'T wait until your cylinders are choked with carbon. Prevent this nuisance by using Johnson's Carbon Remover regularly. The use of Johnson's Carbon Remover every 500 miles will keep your motor running quietly and full of "pep"—will prevent carbon formation—will reduce your gasoline consumption from 12 percent to 25 percent and give you maximum power and speed.

JOHNSON'S CARBON REMOVER

½ Pint—75c



You can easily apply Johnson's Carbon Remover yourself—in five minutes—without even soiling your hands. All you have to do is remove the spark-plugs, pour in an ounce of Johnson's Carbon Remover, let your car stand an hour, then start your engine and the carbon is carried out through the exhaust.

Insist upon your dealer supplying you with Johnson's Carbon Remover. There is no substitute.

Mail the attached coupon for our book which tells how to reduce automobile depreciation with Johnson's Car Savers.

S. C. JOHNSON & SON
RACINE WISCONSIN
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Send for this book--NOW

S. C. JOHNSON & SON, Dept. AD7, Racine, Wis.

Please send me free and postpaid your book on "Keeping Cars Young."

Name

Address

Dealer's Name

CHANGING CARBURETORS—SETTING VALVES

(Continued from page 44)

piece with an axe and the chamfered corner roughly fitted against the wheel, then the blocks were crowded tightly against the wheel and fastened with two nails to each block, driven into the piece of board under the wheel. Had the garage floor been of wood, the blocks would have been nailed directly thereto instead of being placed upon "shoes" as described.

To support the car after it had been raised to the desired height, some scantlings and boards were nailed together as shown by Fig. 1, and after the car had been raised as far as necessary, the vertical members of the blocking were cut off to fit under the springs, close to the rear axle clips. That blocking held the heavy car without a sign of distress, but to make things doubly sure, after the rear axle had been detached from its springs and control rods, it was "jacked down" and the blocking again piled underneath the car on each side, just beside the framed blocking, and left there until the rear axle was replaced.

A Broken Gear

The rear axle was taken all to pieces. Each part was removed, well cleaned until free from every vestige of oil or metal-dust. Three processes were used for cleaning the axle parts. First, they were scraped as free as possible from thick grease and dirt, then they were roughly scrubbed with kerosene oil, a four-inch flat paint brush being used to apply the kerosene. After using, this oil was placed aside for at least 24 hours. Then the clear portion thereof was drawn off to be used again for other and future cleaning processes.

A second brush-washing was given to each piece with clean oil, using the same paint brush for its application. Following this washing, the parts were allowed to drain, and when necessary (only for the smaller and finer pieces) they were rubbed with wipe-rags and placed aside for examination, repair or replacement. The latter, however, was very little.

Not until the transmission was entirely dismantled, was the cause of the "knock" brought to light. Then, the owner found wedged between two teeth of the 12-inch (low speed) gear, the end of a broken-off gear tooth. Each time the large gear came around, the fifteen-tooth pinion would strike and ride over the wedged-in tooth-point. Looking further, the owner found fifteen tooth-ends broken off and fourteen of the pieces in the bottom of the axle case.

PREMEDITATED

"Really," gasped the automobilist, bending over his victim, "really, I didn't hit you intentionally."

"Aw, go on," returned the fallen one belligerently. "whatcher got that bumper on yer car for, if you don't aim to go runnin' into people?"—*The Lightning Line.*

Expansion Aligning Reamers Watervliet Tool Co., Inc.	6	Patches Ever Last Tread Co.	16
Fenders Superior Lamp Mfg. Co.	14	Pedal Pads and Extensions Auto Pedal Pad Co.	10
Friction Paste Zip Mfg. Co.	4	Piston, Rings Auto-Diesel Piston Ring Co., The, ... Everyday Piston Ring Co. Pressure Proof Piston Ring Co. Kendell Engineering Co.	13 19 63 14
Fire Extinguishers Presto Fire Extinguisher Co.	61	Pistons Kant-Shore Piston Co.	12
Garage and Shop Equipment Weaver Mfg. Co.	2	Pedal Appliances Grant Auto Appliance Co.	16
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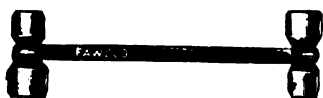
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THE FITZALL HOSE CLAMP

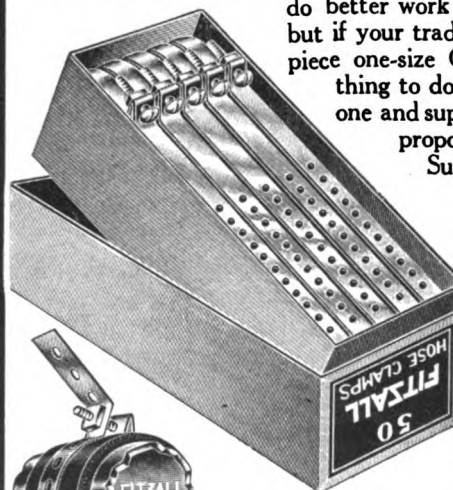
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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 16-22 Hudson Street - New York City

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Vol. 33, No. 6.

AUGUST, 1922

Monthly \$1.50 per
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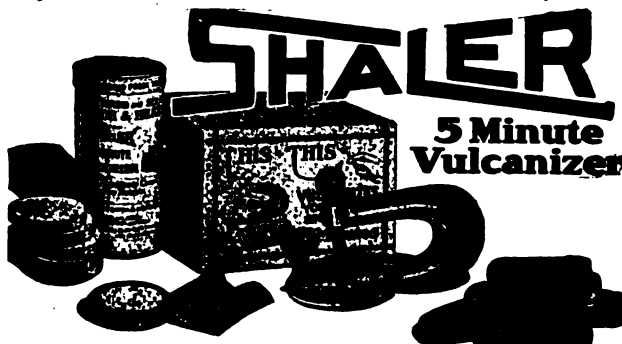
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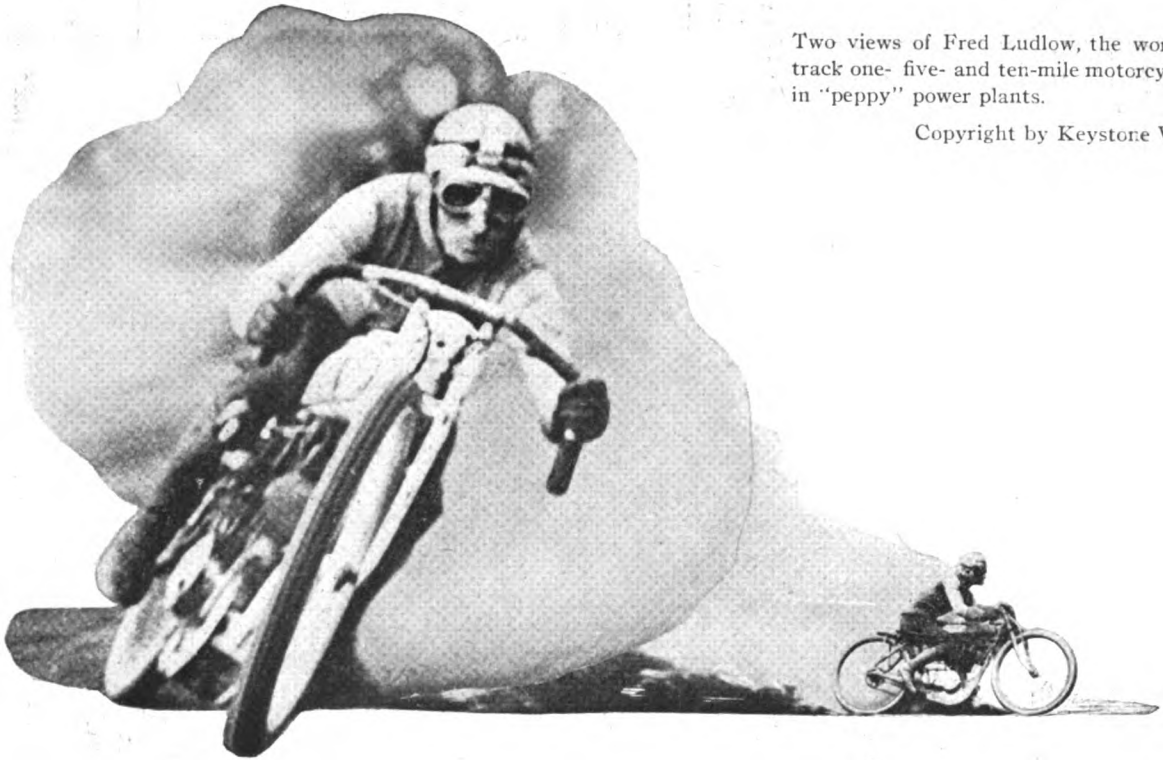
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Two views of Fred Ludlow, the world's champion dirt track one- five- and ten-mile motorcyclist Fred bellevue in "peppy" power plants.

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Loss of compression, seepage of oil, befouled spark plugs, and clogged valves never pile up any speed records or contribute to motor efficiency. To eliminate these faults pistons and rings must fit the cylinder bores as snugly as the "ocean to the shore."

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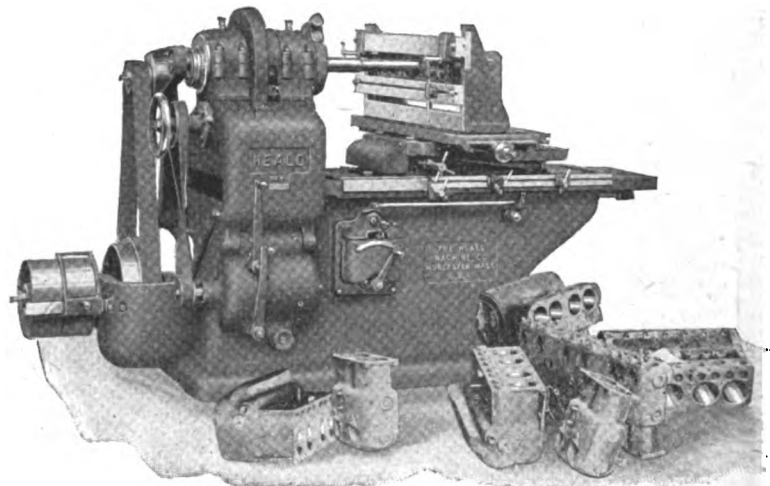
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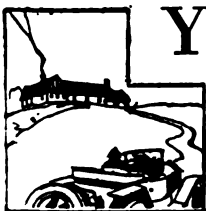
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AUGUST, 1922

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Digging For Repair Material On the Sea Shore



YOUR patient editor has just returned from his annual and much welcomed vacation and so, in this first article if he wanders off his subject from time to time, you must pardon his digressions. A vacation has the effect of putting pep into a devitalized scribe, but unfortunately it also tends to leave fond memories.

Always when I return from my vacation I have an intense cosmic urge, at least I suppose that is what it is, to compile an article which will convulse my readers with mirth and attract the jealousy of all the great humorists, but I'm limited, sadly, by mechanics. I cannot vent my humor unless it is upon or toward machinery for this is a mechanical paper, so I will never be classed among the notables of fiction unless by some mistake the Saturday Evening Post takes me upon its staff.

The island upon which I spent my time was only large enough to support two automobiles, a 1902 Reo

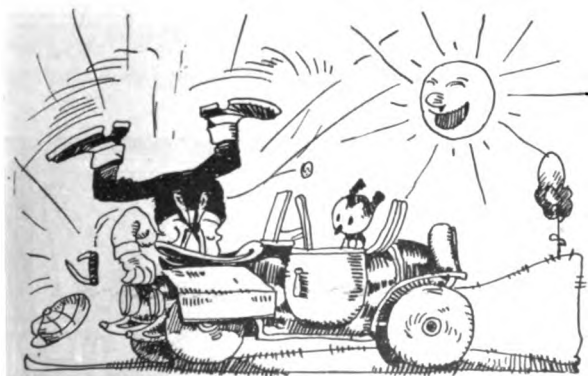
and a 1904 Ford. Both machines seemed entirely capable and trustworthy, though I caught myself blushing every time they passed me because they had been divested of all surplus parts to a point where they were positively indecent, much like a lady in a one-piece bathing costume.

I really tried to get some material for a story from these two cars, the Reo especially, but even the oldest native on the island could not recall anything eventful relating to either machine, and when the oldest native cannot tell a story about an object, there is no story to be told.

As far as I could see the old Reo car had been reduced to a state of primal simplicity, no mud-guards, no paint, no body except a rude box, no seat except a flat board, no hub caps, no radiator cap, no nothing except an engine, four wheels and a smell. Tire trouble did not seem to be a menace for the tires went un-inflated most of the time.

This old car shuttled back and forth between the wharf and the general store. Its garage was only the blue sky above and the sand beneath, it thrived on sand and mud and a good rain storm only seemed to soften up the grime upon it so that more dirt could stick. It would run through sand to the hubs, go over rocks and fences as easily as a goat and while I was on the island it didn't even groan or skip once.

The old Ford was subjected to about the same abuse as the Reo. Viewed a few feet away the two cars looked like a big lump of mud accompanied by its smaller brother. The Ford car was blessed with a windshield and a top, or rather what remained for the only glass in the shield was a triangle at one corner, and the



"Heels Over Head, Trying To Find Why Something Isn't the Matter"

top looked like a broken sieve. The top would have offered no protection even in a rain of elephants.

The Ford car was always parked beneath the only available tree on the island. There must be something about the salt sea air which surely keeps these two old cars young.

But I think there is something else besides the air which is responsible for the longevity of these cars and the secret is easily told. The old salts down on that island are too darned busy pulling lobster pots to waste time monkeying around engines. When the engine runs all right they leave it alone.

But when an automobile driver finds that his car is reeling off the miles he gets jealous, he cannot understand it, so he stops by the roadside and investigates.

On my trip home, through New York State especially, the fact was brought home to me quite forcibly that the average driver is never satisfied. I passed dozens of motorists, singly and in groups, heels over heads beneath the hoods of their cars, not trying to find out what was wrong by trying to see just why everything was all right.

One motorist in particular excited my ire by cutting in ahead of me at a 40 mile an hour rate, passing me



When She Runs Well,
Give Her Credit and
She Will Appreciate
It.

in a cloud of dust. His car was humming along smoothly as a Rolls-Royce and yet while I was still watching him he drew up beside the road, hopped out with his whole family, seven or eight in all, and started to tinker with the engine. As I passed him I noticed that two of the kids were pulling at the ignition wires, his wife was lifting out the front floor boards and he was crawling beneath the rear axle. Seems unbelievable, but it's true nevertheless.

I think that the old salts on the island have learned their lessons from motor boat engines. Take the average two-cycle motor boat engine and you have a thing of superlative cussedness with a temper like a wild hyena and a temperament like a prima donna. It crouches in the bottom of the boat like a tarantula, but asleep; you approach it and give its nose a tweak and it either sneezes or

coughs. If you are not acquainted with it, it strikes like lightning.

And if you try to make it run forward, it goes back-



But Don't Bother Her
Too Much or She
Will Kick Back

ward; twist its tail backwards and the pesky thing goes forward. Swear at it and it won't go; and if you don't swear at it, it simply won't run. Once you do, finally, persuade it to perform properly you turn your back on it and hold your breath—but above all, you leave it alone.

Unfortunately the automobile engine is not so human, it usually will run after a fashion, so that there is really no incentive toward neglecting it. Therefore the normal driver monkeys around his car fixing something that is already fixed, and unfixing anything that can be disturbed until even the well trained engine quits in disgust.

It was a good lesson to me to see the tires on the two old cars which were on the island, white as chalk and almost as dry and sandy. The treads were cracked and the side walls seamed by exposure to the hot, seaside sun I found that tires seldom were worn out on the island, they were burned out. A new tire in the spring would blow out before the middle of August, after having been run only a few hundred miles. The sun would bleach and rot the rubber until it literally fell off, then the salt water would break down the fabric in a few weeks.

This effect of the sun's rays was more pronounced on the seaside, of course, than inland; but nevertheless it resulted in my buying a tire cover as soon as I reached an accessory store for I realized that I was only throwing away good tires by leaving them exposed on the carrier at the back of my car.

But notwithstanding the dearth of automobile material on my vacation island, there was a great plenty to be obtained both on my upward and return trips, over 500 miles of country, through villages consisting of one station and two houses and through cities where the traffic cops wear white gloves and an important air of majesty.

I have infinitely more respect for the kindness of the small-town, or small-city traffic officer, than for his second cousin, the New York corner traffic cop. Just as an experiment I made a point of asking my way from



the traffic officers, rather than depending upon the route books for my directions. In the larger cities, and especially in New York, the officers seemed to have a perpetual grouch but only pleasantness greeted my questions in the smaller towns.

But it is easy to forgive the New York policeman for his grouch against motorists. Unquestionably there are enough rotten drivers in New York to try the patience of a saint, at least I have found it so, and I average some few thousand miles a season in this city.

During the week days the traffic is reasonable, but on Saturday afternoons and Sundays, the "week ends," and I suppose I might call them "weak end," motorists are a menace to decent drivers. They will shoot out of a line of cars and before you know it, be wedged between your front fender and bumper in a vain endeavor to cut-in ahead.

My trip back was on a Sunday and in the early evening so that I was in the thick of the "weak end" crowd. On two separate occasions drivers, with cars literally overflowing with passengers, cut-in so closely ahead of me that my bumper scraped their mud-guards. I suppose the same thing is true of all large cities and until some sort of traffic control is arranged this menace will continue. But I'm digressing from my main theme.

I believe that it is far better to be safe than sorry and for this reason I try to anticipate all automobile troubles. I have driven cheap cars ever since the early 1900's and only twice has it been necessary for me to call for a towing car to get my machine home. In both cases the rear axle went wrong and a roadside repair would have been impossible.

Always Have the Crepe Ready

When I take a long trip I always prepare for the worst, I expect to get into trouble of some sort and, being fully prepared, with the crape all ready to hang, so to speak, my anticipations are seldom realized. Despite the fact that my present car is almost new, I carry a full supply of tools and it really annoys me to find a long distance motorist, stuck beside the road, with nothing to effect his own salvation.

On my way up to the island I noticed many cars, stopped beside the road for repairs of various kinds, some were out of gasoline, oil or water and many had tire troubles. I have the greatest of sympathy for the motorist with tire trouble, but when he runs out of gas, oil or water miles from the nearest station, I feel that he deserves what he gets.

One motorist, though, attracted my special attention, a young lady, 18 or 20 years old who was driving a very expensive roadster. Her car was capable of making from 40 to 50 miles an hour without effort. She passed me some four or five times between New York and Springfield, and I cannot yet see just why she didn't leave me far in the rear for she must have gone at least 35 miles an hour most of the time, and I was running at only about 25 most of the time. Perhaps her engine ate up more gas than mine and her tank required more frequent filling.

Finally I came up in back of her car, the other side of Springfield and she wig-wagged me to stop. Evidently she had noticed my New York number plates and felt

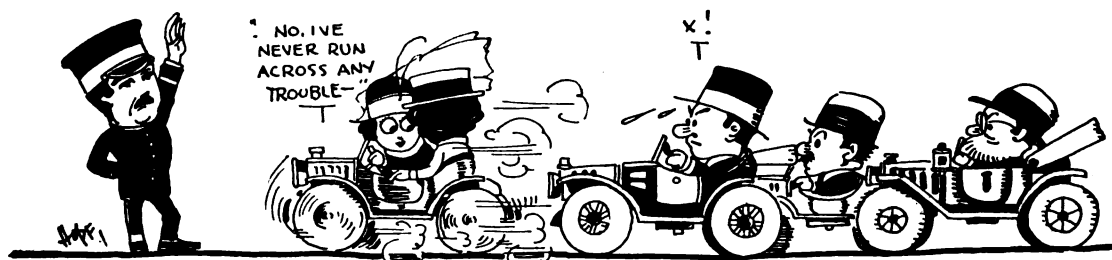


"I Came Up Behind Two Cars on My Trip Home"

that I was a friend in a foreign land. I found her engine was about six thousand degrees in the shade, more or less and there wasn't enough water in the radiator to blind a typhoid bacillus. The only reason she had stopped was because the oil indicator had ceased to show any pressure.

No water, no oil, but she coyly informed me that she was always careful about keeping the tank filled with gasoline—because her dad had warned her against letting the car run dry. She only knew that the oil indicator should indicate a pressure and if it didn't, why something was wrong. Her father hand trusted her with a \$4000 car and all she knew was that gasoline was necessary!!! I spent nearly an hour telling her a few facts which she should have known about automobiles, gave her some oil, lugged three pails of water from a nearby farmhouse and finally got her started again. I'm sorry for the car if she is to drive it back to New York again.

It is a darned good plan to fill the radiator every chance you get, on a long trip, and it is also advisable to put some oil in the engine every time you stop for fuel.



The New York Traffic Officer Can Be Forgiven for His Chronic Grouch

A quart of oil in a hot, hard working, steady running engine does not last as long as the same amount on short trips.

Have you ever been in the embarrassing position of being asked by a motorist for a tow? I have had a number of friends who have towed cars home, or to a garage, much to their sorrow.

The average small car is built light and its rear axle is not made to carry much of a strain in excess of the car's own weight and its capacity. Take such a car, hitch it to a disabled car, even a light one, and its axle is seriously strained. On my trip I saw a Ford car towing a seven passenger, light car, of a popular make. I should hate to buy that Ford car without giving the inside of the rear axle a careful examination.

This recalls an experience I once had in which an unknown benefactor was chief sufferer. I was the victim of circumstances. I think I mentioned in the first part of this article that I had been towed home just twice, and it is of one of these times I would speak.

My old Ford car, 1906 vintage, had laid down on the job; the master gear had severed its moorings with the differential housing and I was disconsolately sitting beside it, waiting for Lady Luck to come along and offer assistance, when she did in the shape of another Ford driver.

A Kind Hearted Motorist

This driver was so good natured that he offered to tow my car home, a distance of only a few miles. At first I protested on the ground that I didn't think his car strong enough, which naturally excited his pride. He said he would assume all responsibility and we fixed up a tow rope. As usual with those old cars, my emergency brake was ornamental only, and my service brake was out of commission because of the rear axle break. This little fact slipped my mind when we started, but at the next hill I remembered it.

We had progressed but a fraction of a mile when we reached a sharp decline and my benefactor chugged merrily down. My car was not chugging at all and had the opportunity to concentrate all of its efforts upon motion. Half way down the hill I passed my towing car and before we had reached the bottom I was towing him, and doing it with considerable more effect and speed than he had expected.

We had a council of war before we attempted the next grade and he decided to put on full steam, and thus keep ahead of me. He thought that he could keep ahead of me, now that he knew what to expect. But he was wrong, there was a curve in the hill, the road was rough and a car was coming up the grade about as fast as we were descending it.

I figured that I must have been going about ten miles an hour faster than he when I bumped him the first time, about fifteen miles an hour faster when I clipped off his rear fender on the curve and at least twenty miles faster when I passed him at the bottom.

At the bottom of the hill I swished past his car, missing him by an eyelash and kept on at almost cannon ball speed. My car brought up upon the tow rop with a sickening shock which swung the rear of his machine half way around before the rope broke. He drove off the road, into a ditch and half way through a field of standing corn before he recovered. But he was a dead game sport and had the tenacity of a bull dog.

Merely a Common Incident

Beyond bending his fender, which was easily straightened, no damage had been done so we tied up the tow rope and went ahead. The few other grades which we descended were not difficult and he managed to keep ahead of me. But just as we were in sight of my garage, going up a rather sharp knoll, he put on speed for the climb and snapped the tow rope. At the same time something happened in his rear axle and both of our cars were ready for the repair shop. Although I gave my local repair man two axle jobs instead of one, I doubt if anyone was particularly pleased at the outcome.

Since that time I have been careful about towing stranger's cars. It is all very well to feel that your car is capable of towing a locomotive, but it is better to think so in your own mind than to be dis-illusioned. Leave the towing business for cars with heavy rear axles or trucks.

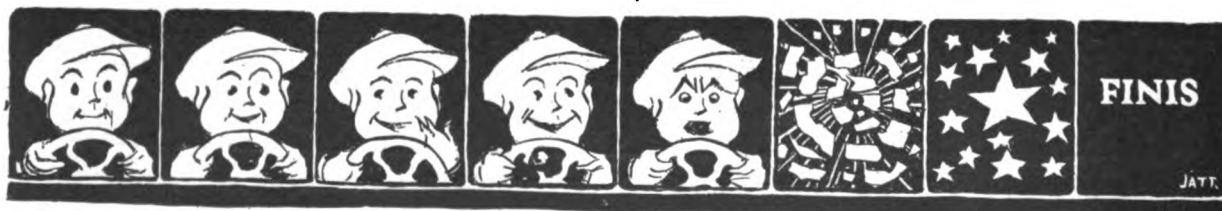
Personally I like to help fellow motorists. Nothing pleases me more than to stop beside the road and show a bewildered stranger where to hitch that extra wire which he has found hanging beneath the car, or to wait while he patches a tire with my "Five-Minute" vulcanizer. I'm willing to loan him any tools I may have, though I watch them with eagle eye, but I drew the line upon loaning my tire pump.

A Pump Contains Only So Much Air

I figure that my tire pump contains a certain number of "blows," and no man living knows just how long it will last. If I pass out, freely, all of those blows to unfortunate motorists, there will come a time when I will need to repair my own tire and be short about 50 pounds of fresh air. And it is humanly impossible to put 50 pounds of air into a tire with a pump which has retired to a life of ease.

It is amusing, as well as often annoying, to be stopped by the owner of a faltering flivver and asked for first

(Continued to page 46)



Small Newspaper Advertising

How the Small Business Should
Be Advertised in Local Papers

By A. B. Cassett



THE small newspaper advertisement, cleverly written and sometimes pertinently illustrated, has become a very effective factor in garage advertising.

Be quickly assured that advertising is not an expense, it is an economy. The garage that is well known, through advertising, always operates at a lower selling cost than the garage that does not advertise.

We work for the good of everybody, and in turn everybody works for the good of us.

We used to hear men say, "Oh I'm not in business for my health" but the fact is that a man who isn't in business for his health hasn't very good health or much business. Men who can look back forty years will tell you that any old kind of a place was considered good enough for a shop at that time.

Today it's safety, light, heat, ventilation, all the important factors in business. Every convenience for doing things in the best way possible is now being utilized.

Each and every profession is also, nowadays, a business. Your business is the thing that keeps you busy.

The more brains, purpose and courtesy you bring to bear in your business the greater your reward and the reward is incidental to the service rendered.

The sample advertisements shown in this article may be changed of course to suit your own ideas but in the main they will be found to be suitable for the encouragement of business to your side of the street. No matter how much your ad may appeal to the reader, nor how much he may be attracted by your proposition you must remember this: It is an absolute fact that people generally know more about auto parts and accessories than they did ten years ago.

One will frequently meet with folks who can talk auto mechanics by the hour. How must a garageman or a garage mechanic feel who can not answer questions, and is unable to converse with people on repair work? Not that you necessarily have to converse with them regarding the work but would you not be really retarding your business by losing the chance of cultivating personal friendship by not being posted?

A strong personal friendship is the most substantial foundation for a permanent trade. By a personal attachment in business I do not mean, so much social relation, as a recognition by the customers of those qualities in the garageman which entitles him to regard and confidence, or a feeling that they are dealing with a warm blooded man and not with a cold unfeeling machine, like an organization whose only ideas is dollars and cents.

Putting your advertisement in your town paper is a

good thing to do and it is easy to do but don't do it unless you make up your mind to give the best—the very best and most courteous service.

Back of your newspaper advertising there must be sincere and honest shop management. The young garage mechanic can not afford to criticize to outsiders anything about the garage, no matter if the criticism is justified. It injures your reputation and it weakens the organization in which you are working. So it makes your job worth so much less. Your position is not as valuable in an organization not working harmoniously. And if you are not loyal to the garage and the kind of service it sells, you certainly will not be able to put over your selling arguments successfully. Your word will be discredited to some extent.

If you lack faith in your business and show it, if you haven't full confidence in your service and enthusiasm for

QUALITY REPAIRS

WITHOUT
THE PENALTY
OF A
HIGH PRICE

ROYAL GARAGE
80 Speed Place
PLEASANTVILLE, VT.

it and if you indicate as much by being a crabber, how can you expect the public to have a confidence and interest greater than your own?

Whether you are handling a regular customer or a transient, if you show that you are not 100% loyal, you arouse distrust of the garage and its service. You drive customers away and they stay away and under these con-

ditions even full page advertisements would be of no avail.

It's the service back of the advertisement that counts. Haven't you seen instances where a mechanic failing to find something just where he thought it ought to be has, in the customer's presence, said, "I'd like to know why in

being disloyal, even among the customers you are favoring.

You cannot be for your boss and your garage and against it at the same time. You must have a well defined position, and the customer knows that your position should be on the side of the garage. We know there is a yellow streak in the mechanic who is willing to stick a knife into his organization and nobody trusts that kind of an employee.

There can be no team work where there is constant crabbing. Competitive effort is impossible when the different workers are constantly jabbing at one another below the belt. There can be no friendly competition for highest honors in a force with its men at odds. The crabber keeps the rest of the men from making good and keeps himself from making good.

You can't always put the blame on your town newspaper for poor results from your advertising, Mr. Garage Boss, for perhaps you may be at fault. Do you come out of your cage or get up out of your chair to meet folks as they drive up? Or do you allow your customers to wait around and rubber neck to see if there's anyone about your place that is on the job?

Do you really think out the methods you use in your garage—or your accessory store if you have one in conjunction? In this connection can you give a good reason for everything you do? For example: why do you order goods as you do, and how often do your order? Do you send an order to your wholesalers only when your bins and tables are empty? Do you write them for goods only when a customer finds you're out of merchandise? Do

**Don't Try to
Get Along
JUST ONE MORE DAY**

**With that broken part still in
your car. You are inviting**

A Break Down

See

JONES

AT HIS GARAGE

10 Quality St.,

Goodtown, N. Y.

thunder they can't put that wrench back in the same place twice in succession" or "whose been shifting these tools around again"?

And haven't you heard mechanics say things that discredited the quality of certain auto parts when the customer was making no complaint? For example, "I don't see why they keep two grades of these bolts any way. That one there is no good"?

When a customer makes a complaint and the mechanic takes it up with comment that there have been a good many similar complaints, the customer realizes at once that his is not an isolated instance, and the reputation of the shop suffers accordingly. Complaints must receive attention—careful attention, of course, but the mechanic ought to do everything possible to make it appear that those complaints are the exception, not the rule.

In making business friends it is well to have the right point of view. When the mechanics in a garage think more of their personal standing with the customer than the standing of the garage, when they try to get in right with people by siding with them against the business, it is going to be expensive for the business.

When the garage is in the wrong it is the business of the mechanic to explain as best he can and smooth over the situation. He should do it, however, as a member of the garage force and with the garage's interest in mind as well as those of the customer. To side with the customer against the garage will give you the reputation for

NOT THE LEAST

**of this institution's assets is
the confidence which our
patrons place in our ability
to serve them capably and
well.**

AUTOMOBILE REPAIRS

**made by experts—men
thoroughly experienced in
exacting workmanship.**

TRACY'S GARAGE

**16 Dowell Avenue
HUSTLETOWN, N. J.**

you postpone your buying until a traveling man comes?

If you wait until your bins are empty or until a customer calls your attention to your lack of certain kinds

of merchandise, you are doing business by guess-work and really deserve to fail. In this case you are not running your garage or your store you are allowing things to run themselves.

Do you wait until necessity compels you to get goods? If you postpone buying until a traveling man comes you have a lazy garage and store. You don't work or buy when you ought to, but when it is easiest for you to do so; when somebody else can lighten the burden.

You should have a perfectly definite plan to build your buying. You should know how much merchandise you have sold over regular periods in the past. Only in this way can you know the merchandise you will need in the future.

Combine statistics of this kind with the needs of your market and you'll come pretty close to judging the demand. Don't always wait for the travelling man to come. Send in a small order. Stop long enough to consider how much better it is to look ahead and prepare than to look back and regret. Try planning your work for one month and note the results. Then paint in imagination the results of 10 years work according to a plan.

AUTOMOBILE REPAIRING **DONE RIGHT**

When any concern wins great success in its particular field it is reasonable to believe that its methods and the value represented in its service are far above the average.

The Boss is always
on the Job.

JACKS GARAGE

32 Main St.

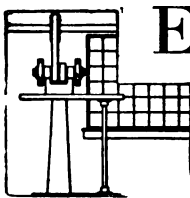
Goodwin, N. H.

Money comes unbidden to the hands of the thorough, for he who is thorough loves his work for its own sake. Back up your advertising, don't expect your town paper to do it all.

If garage owners who are now publishing their advertisements in their town paper will cut out a few of them and send them to our Advertising Department, we will be glad to comment upon their good points and suggest adjustments for improvement.

CLEAN AND LUBRICATE OVER HEAD VALVES FREQUENTLY FOR SMOOTHNESS IN OPERATION

By Ronald R. Prindle



ENGINES of the over-head valve type are increasing in number each year, few, if any, of them have any provision for oiling automatically by the engine, which is very essential if these would operate smoothly indefinitely.

Each morning before taking the car from the garage is the best time to give the rocker arms, pins, push rods and tappets a few drops of oil each at the points where wear will occur, and one is repaid in the silence and smoothness of the engine.

In addition to this rocker arms, etc., are given a kerosene bath once a month with an ordinary paint brush, then wiping up excess kerosene with clean waste or cloths. This removes accumulations of dirty grease and grit which cause rapid wear.

Once a month the valve setting or clearance should be checked up by means of a valve gauge to determine the amount of clearance, otherwise too much or too little clearance may effect engine operation noticeably.

The clearance should be about .004 of an inch, or the thickness of a sheet of letter paper, when the engine is cold. Means of adjusting is usually at the bottom of the push rods. When properly adjusted, tighten the lock-nut to prevent its working loose. Valve springs are tested occasionally to see that these are not broken or weak. While the engine is running slowly, place a screwdriver between the coils of the spring and by prying up slightly, noticing if the engine action is improved, which means this spring is too weak and should be replaced for efficiency. Each one is given a like test. If all valves are checked up for clearance, adjusted and then oiled thoroughly at stated intervals the motorist is assured satisfaction.

THE READY ANSWER

A city business man was very keen on having proficient clerks in his employ. Before a clerk could enter his office he was required to pass a written examination on his knowledge of business.

At one examination one of the questions was: "Who formed the first company?"

A certain bright youth was a little puzzled at this, but was not to be floored. He wrote:

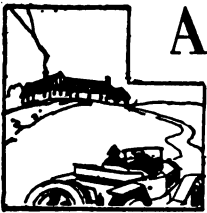
"Noah successfully floated a company while the rest of the world was in liquidation."

He passed.—*London Answers.*

Commutator and Brush Repairs

The Only Parts of the Motor or Generator Which Tend To Wear Out

By F. L. Almy



ALTHOUGH the mechanical working parts of an automobile engine usually attract the most attention when they go wrong it is merely because the engine protests, or will not run at all, that this attention is given. When a part will run along without any protest, or without giving shrieking evidence of neglect, then it is often left alone, much to the detriment of the whole machine. Such a unit, which is often neglected, is the generator.

As long as a generator will hold together and so long as its wiring is unimpaired it will usually do its work it may squeal some and may act like a pinwheel at a fourth of July celebration, but its fireworks are usually so hidden in the generator case that they go unnoticed.

When the ammeter starts to play tag with itself and hops all over the scale, then it is a good plan to look inside the generator and watch the wheels go round. Now, mind you, I don't say that you will always find the trouble in that unit, but if that unit is at fault it is not a difficult matter to find out that it is wrong.

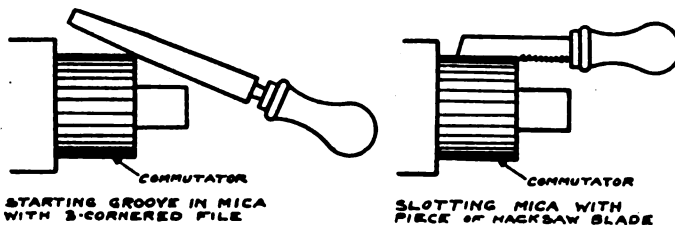


Fig. 1. Preparing and Slotting the Mica in the Commutator.

Commutator and brush troubles usually evidence themselves by a display of fireworks. Under ordinary conditions there should be few, if any, spaks showing between the brushes and the commutator. But it is not an uncommon thing to find a rope of fire entirely surrounding the generator commutator while the generator is producing its normal output.

Present day generators are wonderfully well made affairs and when you stop to consider that a generator runs as long as the engine does, requires only a drop of oil occasionally, (when the driver happens to think of it), and will usually outlast the car itself, then you are able to appreciate its excellence.

Except when a generator is badly abused, the wiring and connections seldom go to pieces. There are but three working parts to the generator which are subject to normal wear; the bearings, the brushes and the commutator. In this article we will consider the wear of the brushes and the commutator and the method used for the repair of these parts.

When a generator shows excessive sparking at the brushes the trouble is usually in either the brushes or the commutator. In such cases the sparking is caused by poor brush contact with the commutator segments.

The commutator consists of a number of copper bars, placed parallel with the armature shaft and each connected with a coil of the armature winding. These bars are separated and insulated from each other by mica or some other insulating material which will resist wear. This insulating material is usually harder than the soft copper used in the bars.

In due time the copper bars will wear, naturally, and will wear below the surface of the insulating material. The brushes will rest upon the insulating material and the current will arc to them from the commutator bars.

Repairing the Commutator

To restore a commutator to its efficiency it is necessary to do two things; first to turn the commutator and make it perfectly round and second, to cut the insulating material away so as to bring its surface slightly below that of the copper bars.

There is a right and a wrong way to do this work and hence, this article. The armature must first be removed from the generator and placed between lathe centers. The commutator is then faced off so as to be perfectly round. In doing this it is important that the finest cut permissible be taken and only as much material removed as may be necessary to restore the commutator to its shape.

At first thought it might seem that this is no problem, but it is a mighty big job and offers wide opportunity for errors. The soft copper segments will cut easily, the mica insulation will offer great resistance to the cutting tool and unless the tool is properly ground, properly

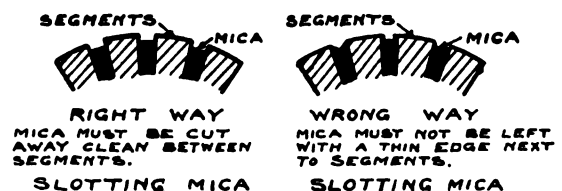


Fig. 2. Right and Wrong Way of Undercutting the Mica

mounted in the tool post and heavy enough to resist chattering, the completed job will be worse than the work before it was started.

Where the mica projects above the copper it is best to start the cutting tool so as to remove only the high spots first, making a two or three cut job of it rather than trying to finish off in one cut. A file, sandpaper or

emery cloth **MUST NOT BE USED** for restoring the roundness. (The use of these may result in the embedding of copper particles in the insulation and consequent arcing).

When the commutator has been restored to perfect roundness, the next step is to undercut the mica. To start the work each insulating slot should be cut slightly with a three-cornered file. Having thus established a guide for cutting, mount a hack saw blade in a wood handle as shown in Fig. 1 and cut away the insulating material to a depth of 1-32 of an inch.

The hack saw blade in common use is about the correct width, or wider in some cases, than the regular mica insulation. If the saw is too wide it may be ground on one side so as to be the correct width. The saw should cut a slot just a bit wider than the insulation, but no wider than necessary to remove all of the mica. It is extremely important that no mica be left in the groove thus cut. Fig. 2 illustrates the correct and incorrect methods of cutting.

Remove All Sharp Corners

Having removed 1-32 of an inch depth of mica the edges of the copper segments should be scraped with a very fine file to remove the sharp corners and any burrs that might exist and then the armature may be returned to the generator.

It must be remembered that the commutator is now smaller than it was originally and therefore the brushes do not fit properly, which brings us to the second chapter of our story.

Excessive arcing at the brushes may be caused by poorly fitted brushes. The commutator may be in excellent condition but if the ends of the brushes do not contact properly, then arcing or sparking occurs and the generator will overheat or possibly the commutator will be destroyed.

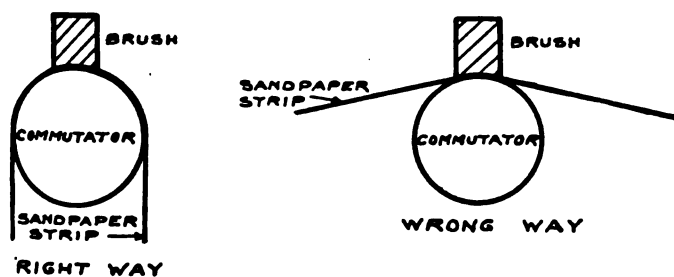


Fig. 3. Right and Wrong Way of Sanding the Brushes

When new brushes are put into place they must be fitted properly. The same thing is true when the position of brushes is altered. In fact any change in the brushes or commutator should be followed by the refitting of the brushes.

In figures 3 and 4 we have illustrated the correct and incorrect ways of fitting brushes. With the brushes and armature in place, a strip of sandpaper, wider than the brush and long enough so that it can be passed at least half way around the commutator, is worked back and forth.

Emery cloth must not be used because it will leave

fine bits of abrasive in the carbon and the commutator will be scratched. The sandpaper must conform to the circle of the commutator or the brush will be sanded

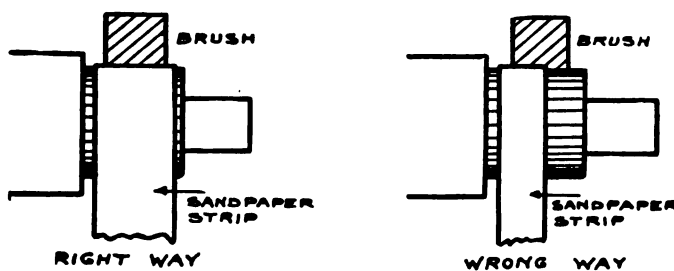


Fig. 4. Side View of Sanding Operation

flatter than the circle, as shown at the right in figure 3.

After the brushes have been fitted properly, the assembly should be wiped clean and the commutator given a thin coating of vaseline. To do this, the finger should be moistened with the vaseline and then wiped upon the commutator. All surplus vaseline should be wiped off.

If the work has been correctly done, then there will be practically no sparking between the brushes and the commutator. In a short time the copper segments will turn a reddish brown, with a hard glaze and will then last for a considerable length of time without appreciable wear.

NUTS SHOULD ALWAYS FIT

Copyright, 1921, by W. F. Schaphorst

MANY amateur machinists never think of the fact that a poorly fitting nut should not be used on a bolt, especially if the function of the bolt is important, and if it must resist much of a pull. In fact, poorly-fitting nuts should *never* be used.

The sketch shows that a nut of one thread, say 12 threads per inch, can be placed upon a bolt of ten threads per inch. It depends upon the thickness of the nut. If too thick you can get it on only part of the way. However, too many amateurs think—"Well, if it will go on part way, why doesn't it go on all of the way?" and then it is forced on with a wrench. In forcing it on the threads on both the nut and bolt are ruined.

In cases of this kind it is evident from the sketch that only one thread can be in contact, and that isn't in contact all the way around because of the varying pitches. And if the nut is so long that another thread comes in contact the second contact will be on the "other" side of the thread so that when the nut is forced on it does nothing more than "oppose its own self" and ruins both nut and bolt.

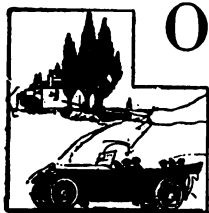
Nuts should not be used that are "too big" even though they have the same thread and "seem" to fit except that they are very loose. Where nuts fit in that way they are held by the "tips" of the threads only and it doesn't take much of a blow to shear those tips off, as you have perhaps learned through experience.

In a nutshell—use only nuts that **FIT**

The Ford Car Cut-Out

Upon the Action of This Unit Depends
the Whole Electrical System

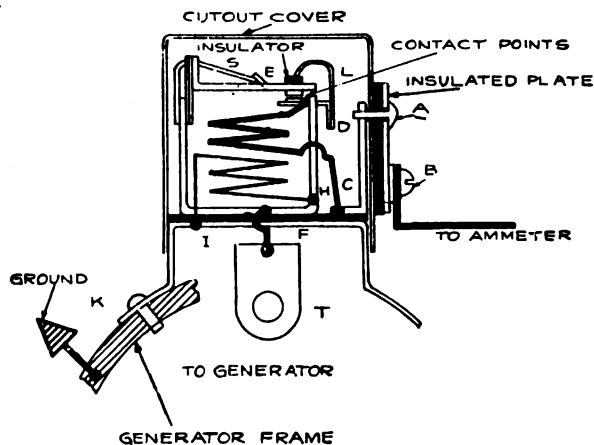
By R. E. Phillips



ONE of the vitally important units on the late model Ford cars is the cut-out for it carries all of the charging current and once it gets out of order the whole charging system is impaired. Under certain conditions the failure of this unit to function properly might lead to the destruction of the battery and, possibly, a serious fire.

Now although we specify the Ford Cut-Out in particular, in this article, the same things apply to many of the cut-outs of other makes on other kinds of cars, so that this article may be considered a general one on all cut-outs of this particular type.

Since the starting-lighting system of the F-A type was first put on Ford cars there have been two methods of mounting the cut-outs. In one case the cut-outs were mounted on the dash board, while in the other case the cut-outs were mounted on the generator frame. In both cases the internal wiring and the general construction of the cut-outs are the same, the only difference being in the type of terminals used.



The Ford Cut-Out; Generator Mounting

We illustrate herewith the cut-out as applied to the generator. The other type, mounted on the dash, carries a terminal connected with the wire T which connects with the generator. This dash-board type has a center terminal which corresponds with the grounded terminal I in the type illustrated. In this case, (dash-board type), the center terminal is grounded to the base of the cut-out, which in turn grounds through the metal dash.

With these two exceptions noted we may consider the type illustrated as being representative of all Ford cut-

outs, so that what is said of this one also applies to all others of the F-A system.

The function of the cut-out is comparable to that of a check valve in a watertank pump system. The cut-out allows current to pass into the battery, but prevents all current from passing back from the battery to the generator.

In order that we may fully understand the device, for we must understand it before we can locate and remedy its troubles, we will trace the various circuits through it and see what happens in its working mechanism.

Mechanically the cut-out is a simple device. It consists of an electro magnet, excited by either or both of two coils of wire; a vibrating tongue and a pair of contacting points. Electrically, the cut-out is slightly more complicated, both in construction and action.

The winding of fine wire, shown at the bottom of the illustration, is termed the voltage coil and one end is connected with the ground, the other with the generator. The heavy winding is called the current coil and is connected with the generator at one end and the contact point at the other.

When the generator is not running the cut-out points are in the position shown, open, so that no current passes through them. As soon as the generator is started and commences to furnish any current, the current passes from T to the frame H, through the voltage coil back to the ground connection I and thence back to the generator, thus establishing a circuit and energizing the cut-out magnet.

When the Cut-Out Closes

As the generator speed is increased the magnetism in the cut-out magnet grows stronger and there comes a time when it is strong enough to overcome the spring tension of S and pull down the armature, or vibrator arm E. The spring tension should be such that the armature E will not move toward the magnet until the voltage from the generator is at least $6\frac{1}{2}$ volts. (The practical charging range is anywhere from $6\frac{1}{2}$ to $7\frac{1}{2}$ volts.)

Just as soon as the armature is attracted to the magnet, the contact points close and a second circuit is set up, the first one through the voltage coil is constant however. This second circuit starts at the same terminal T, flows up to the left, through the armature arm E to the contact points, through them to the current coil, thence to the plate C, through the screw A to the ammeter connection and then to the ammeter, through the ammeter

to the battery and back through the ground or frame of the car to the generator again.

As soon as the generator slows down and its voltage drops below 6 volts, the storage battery throws the current back through the current coil. Now this current tends to de-magnetize the magnet which is attracting the armature E and as soon as the magnet loses its attraction, the armature is pulled upward by the spring S and the current circuit broken. Thus it can be seen that the battery cannot discharge through the generator.

But there is one peculiar exception to the rule just stated and it is well that the reader be acquainted with it. If, for any reason, the voltage coil or its connections with the generator be broken suddenly, the reversal of the current through the current coil when the engine is stopped may be so rapid that the contact points will not open and the battery will discharge through the generator.

Ammeter Usually Shows Trouble

The Ford ammeter will usually give indications of cut-out trouble, should such trouble exist, so that the driver should make a point of glancing at that unit from time to time as he drives. Before leaving the car in the garage or at the curb the ammeter should be noted and if it shows an indication of battery discharge, the cause should be found immediately.

Any normal discharge of current through the generator-battery circuit, to the ignition system, or through the lights will register upon the ammeter. Any short circuits or crossed wire troubles will also be indicated in these systems unless this trouble is between the ammeter and the battery.

Let us suppose that the cut-out is the faulty unit in the following examples and that nothing else is wrong.

The ammeter shows a discharge of ignition current while engine is running but will not show charge no matter how fast the engine is running. Normally, the first thing we would do would be to test the generator and see if it is furnishing current, we will assume that we have done this and that the generator is working properly. Other tests show us that the trouble must be in the cut-out.

(Please follow our illustration from this point very carefully.)

Isolating the Trouble

The first thing to do is to see which part of the cut-out is at fault, the mechanical or the electrical part, the voltage or current coils. Open the cover and press down the armature arm until the cut-out points close. (Engine not running) This will serve to shoot a current back through the generator and re-magnetize that unit, if re-magnetization happens to be necessary, and will show whether or not the current coil circuit is complete. While the contacts are together note the ammeter. The ammeter should show a fairly heavy discharge and if so, separate the points immediately by lifting up the armature to its original position.

If, on the other hand, the ammeter shows no discharge

current it is evident that the current circuit is broken at some point between the connection B and T.

Take a 12-inch length of test wire, about #14, no smaller, and scrape the insulation from each end back about $\frac{1}{2}$ inch. With this wire you can find the broken point in the current circuit by working as follows:

Connect one end permanently with the terminal B. First touch the other end to terminal T to test out the line from the ammeter to the generator. This procedure shorts out the cut-out entirely and the ammeter will show discharge if the connections are O. K.

The idea now is to work backward from T, shorting out the various parts of the circuit until the trouble is found. Touch the test wire to the frame which carries the upper contact point on the armature arm. If ammeter shows discharge, continue with the tests outlined, but if it indicates nothing, then the trouble is in the connection of T with the frame.

Next touch the test wire to the upper contact point. If ammeter indicates nothing, then the connection between the armature E and the frame is at fault.

Close the contact points and touch the test wire to the lower contact. If ammeter does not show discharge, then the contact points are poor. Next touch the test wire to C. If ammeter does not indicate discharge then the trouble is in the current coil or its connection with the plate C.

If the ammeter does show discharge with the last test, while the contact points are closed, then the trouble must be between the plate C and the connection B. Possibly the screw A is lost or makes a poor connection with either C or the outside plate.

Current Coil Trouble Indications

These tests will indicate any broken circuits in the current coil circuit. But this is not all of the possibilities for failure to show charge. If the trouble has not been found to this point proceed as follows:

Start the engine and run it at a speed corresponding to about 15 miles per hour car speed. Ease up the tension on the spring S by touching it gently with a finger. See if the armature is attracted toward the magnet core at all. You may find that the magnet attracts it but the attraction is not great enough to overcome the regular spring tension. If this is the case bend the spring downward somewhat until the armature will close the cut-out points.

As soon as the cut-out points close note the ammeter reading. At 15 miles an hour car speed the ammeter should show a charging current of at least 5 amperes while the cut-out points are held together, regardless of whether the armature springs together or not. If it does not, then the trouble must be in the generator or some of the wires between it and the battery.

As soon as the car speed slows to about 12 miles per hour the cut-out points should open. Adjust the spring tension so that this will happen.

If the armature does not seem to be attracted toward the magnet except when the cut-out points are held to-

gether, then there is trouble either in the voltage winding or the connection leading to it.

And now let us consider the second condition shown by the ammeter. Suppose the ammeter shows a discharge when the engine is stopped and no current is being used for ignition, lights or accessories. Assume that we have found no trouble at any point except in the cut-out. (An easy test to make, remove all cut-out connections and if discharge ceases, cut-out must be the faulty member.)

Remove cut-out cover and see that contact points are not stuck together. If they are not stuck together then there is a short circuit or ground between the contact B and the current coil where it joins the lower contact point, or possibly in the current coil.

If Contacts Are Together

If the contact points are stuck together, then there may be a short circuit in the current coil, a connection between the lower contact point and the ground, or a short in the current coil line between the contact points and the generator. It is also possible that the voltage coil is at fault.

To locate such trouble a number of tests will be necessary. First, find in which coil the trouble may be, pull the armature away from the magnet and see if it is again attracted by that latter unit. If it is attracted, then the trouble is caused by a ground connection either near the end of the current coil or in the lower contact point because the magnetism must be caused by current flow through the current coil.

If the armature can be pulled away and it does not tend to return, then examine the contact points carefully to see that they are not so rough and uneven that the current tends to weld them together. They should be scraped smooth with very fine sand paper and their faces should touch all over.

How Armature Should Function

When the armature can be pulled away from the magnet and does not return again to close the contact points, start the engine and gradually accelerate its speed, watching the armature while doing this.

When the engine speed approximates that of 12 or 15 miles per hour, the armature should be attracted to the magnet. If it does not, then see if the spring tension at S is not too tight. If all seems to be O. K. and still there is no attraction then the voltage coil is at fault.

To set the armature spring properly you will need a volt-meter. Connect the volt-meter between the generator terminal and the cut-out terminal T and start the generator. When the engine is running fast enough so that the generator is producing from $6\frac{1}{2}$ to 7 volts, the contact points should close. Bend the spring, while the engine is running evenly to produce the proper voltage, so that the armature will be attracted to the magnet. Then slow down the engine and watch the voltmeter. If the points do not separate when the voltage drops below $6\frac{1}{2}$ weaken the spring tension slightly until they do separate.

With these directions the average car owner and repair man should be able to both understand the cut-out thoroughly and to fix it when it goes wrong.

HOW TO WEIGH ATTACHED IRREGULAR PARTS

By W. F. Schaphorst.



OCCASIONALLY it is desired to know the weight of some part or other on a machine, but the part cannot be detached easily for weighing and it is too irregular to compute with ease. In such case the weight can be found indirectly by weighing water displaced by the part, if the part projects in such a way that it can be made to displace water.

For example, the writer once had to determine the weight of a flywheel governor weight, which was made of cast iron, and which could not be detached without removing the whole governor from the engine.

He turned the flywheel in such a position that the weight was at its extreme low point and then procured a rectangular sheet metal vessel and filled it with water. He weighed the vessel when it contained as much water as could be held in it.

Then he carried the vessel of water over to the engine and raised it so as to envelop the weighted end. Water was displaced of course, but that is what was wanted. The vessel was replaced until the water level cut the governor arm the writer being sure all the while that the vessel was still holding as much water as possible while raised to that height.

Then he removed the vessel and again weighed it, this time with the remaining water. The weight of the governor end was then computed in this manner:

The first weight was 45.5 pounds and the second weight was 39.25 pounds. The weight of the water displaced was therefore

$$45.5 - 39.25 = 6.25 \text{ pounds.}$$

Now to compute the weight of the cast iron that displaced the water all that is necessary is to multiply by the specific gravity of cast iron which is 7.207, or

$$6.25 \times 7.207 = 45 \text{ pounds.}$$

The remainder of the arm was of rectangular cross-section, whose weight was very easy to compute on the basis of 0.26 pound per cubic inch, which is the weight of cast iron.

In case other metal parts are to be weighed in this manner here are the specific gravities of metals most commonly used in mechanical constructions:

Cast iron	7.207
Wrought iron	7.78
Soft steel	7.833
Steel castings	7.917
Cast aluminum	2.60

Should it be desired to know the volume of the piece of metal in cubic inches, divide the difference in weight (which is equal to the weight of the displaced water) by .0362. The result is the volume of the part in cubic inches.

This latter test will come in handy for finding the volume of any irregular substance that can be submerged in water without harm or without any absorption of water.

Or, should one wish to find the specific gravity of coal, brick, rock, etc., this method, reversed, will serve the purpose.

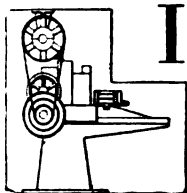
Weigh the rock, say, and then weigh the displaced water (which can be done by subtraction as already explained). Divide the former by the latter and the quotient is the specific gravity of the rock or other substance.

(Copyright, 1922)

Case Hardening Steel

Further Information Regarding Packing Materials to Be Used

By J. F. Springer



IN preparing receipt number 4, the wood charcoal should be ground very fine and mixed with the barium carbonate. This latter substance may be purchased in two forms. In one, it is already in the shape of fine powder, and so is ready to be mixed with the powdered charcoal.

Another form of barium carbonate is the natural mineral known as *withelite*. When bought in this form, it will probably consist of lumps. These are to be finely powdered.

The reader, if he is going to use this packing material, should follow directions very closely, especially the directions stating what proportions of the two ingredients he is to mix together. Six parts of powdered wood charcoal to 4 parts of powdered barium carbonate are the relative amounts. An investigator by the name of Guillet experimented with more and with less charcoal and got poor results. That is to say, he selected very soft steel and impregnated it at 1832° F. This is a *full yellow*.

He tried 8 parts of wood charcoal and 2 parts of barium carbonate. He found a layer on the article 0.01 inch thick in which the impregnation had produced a steel containing 1.14 per cent of carbon. The next layer below, also of 0.01 inch thick, consisted of a steel containing only 0.75 per cent of carbon. This is not even a tool steel. Besides, the two shells differ decidedly the one from the other. This is a kind of thing not wanted, because it will probably result in a very hard inside shell supported by one much softer.

Receipt No. 4

Powdered wood charcoal	6 parts by weight.
Barium carbonate	4 parts by weight.

He also tried 4 parts of wood charcoal and 6 parts of barium carbonate. This gave a result where the two shells, each 0.01 inch thick, were closer together in respect to their percentages of carbon, but the outside shell

did not get a very high amount. The two shells contained carbon in the percentages of 0.94 and 0.77, the higher being of course on the outside. This inner layer is just about the same steel as the inner layer before, the carbon percentages being just about the same.

The reader should now understand that neither a very high proportion of wood charcoal nor a very low proportion gives the best results. Giolitti also tried the proportions of recipe No. 4—6 parts of wood charcoal and 4 parts of barium carbonate, and he got an outside shell of 0.01 inch thickness containing 1.32 per cent of carbon; and also an inner shell of the same thickness containing 1.19 per cent of carbon. This is a splendid result, so far at least. It shows that the carbon is falling off *slowly* as one goes from the outside towards the interior. That is, there is no *sudden* change from very high carbon to a moderate carbon percentage. I don't know how things were below the second layer. Presumably the carbon fell off in a reasonable manner.

The Same Mixture

In all three of the foregoing experiments with varying percentages of wood charcoal and barium carbonate, the temperature was maintained for just about eight hours. The steel was so soft at the beginning that it was practically wrought iron—it contained only about 0.05 per cent of carbon.

There is one disadvantage in using No. 4, and No. 3 also. It consists in the fact that a good deal of *time* is required to heat up. The wood charcoal seems to be largely responsible. The heat of the furnace gets through the metal box and then the wood charcoal slows it down, hindering it from getting through to the work. But this oughtn't to worry anybody over much, for the generality of work, as it is only a question of a few hours.

The effects produced by Giolitti with a recipe identical with No. 4—6 parts of wood charcoal and 4 parts of barium carbonate—are important enough to justify very close study by those having case hardening to do. In a total thickness of shell amounting to 0.02 inch, he got high carbon steel. In fact, he got steel containing enough carbon to make the metal usable for pen-knife blades.

The inner shell contain 1.19 per cent carbon. This is a pretty hard steel. Hardened at a *cherry red* and tempered to a *dark straw*, a very fine grained and very hard shell should be produced. So far, so good.

While I do not, at the moment, at least, have figures for the steel underneath the inner shell, we can pretty confidently rely on it shading off gradually from the 1.19 carbon.

That is, we may be reasonably sure that an eight hour treatment at a *full yellow* with a packing material made by the No. 4 recipe will give results that will combine two very useful things:

(1) A hard exterior suited to resist the wear of friction.

(2) A gradual change to the soft interior, thus giving a fine support against shocks.

May Be Used Several Times

Barium carbonate is not at all expensive, even when we consider past the first cost. Where we take into consideration the fact that this type of packing material may be made to regenerate itself simply by spreading it out where the atmosphere can get to it, the expense is still further cut down. More wood charcoal will have to be supplied after the packing material has been used a number of times. But, even so, the economy of the use of No. 4 in the long run must be considerable.

The foregoing experiments of Guillet have reference to a period of treatment lasting eight hours. The same investigator has made some further and careful experiments directed to the point of answering the question, How long will it take to get a hard shell of a given thickness? For example, How long will it take to get a shell of 0.02 inch thick? The packing material was made according to recipe No. 4.

Let me say at once that the length of time will turn on the *temperature*. Keep that point steadily in mind. The higher the temperature, the more quickly the required depth will be gotten. Well, Guillet used two temperatures one rather low and the other fairly high. That is, he tried two experiments for each depth, one at the low temperature of 1562° F. (= *light red*) and one at 1832° F. (= *full yellow*). Only, he does not seem to have thought it worth while to try the lower temperature for two very deep penetrations of the carbonizing effect.

The Higher Heat Is Cheaper

Well, for the depth of 0.02 inch, he found that, with a *light red* heat, he could get the shell in 2½ hours; while the *full yellow*, he could get it in ½ hour. Some difference, isn't it? To get a shell 0.032 inch deep required, with the lower heat, 4 hours; but, with the higher heat, only 1 hour. To get a shell thickness of 0.04 inch with the low temperature took 6 hours; but with the high, only 2 hours. Again, a shell 0.048 inch thick was obtained in 7 hours with the *light red*, and in 3 hours with the *full yellow*. When it came to getting 0.06 inch (= nearly 1/16 inch), the *light red* produced the shell in 8 hours, but the *full yellow* in 4 hours.

Note, in the foregoing figures, that the best that the *light red* was able to do was to get the required depth of shell in *half* the time required when a *full yellow* was employed. Further, the worst that the *light red* did was to require *five times* as long as the yellow. This was with the very thin shell of 0.02 inch (= about 1/3 of a sixteenth). In fact, the thicker the shell required, the better the *light red* was able to do relative to the *full yellow*. However, even in the very best of the results, the *light red* required twice the time consumed by the *full yellow*.

It will be very well for the repair man to get a good hold on this fact, brought out in these experiments. To get a good heavy shell of 1/16 inch takes about 8 hours with a *light red* heat, and about 4 hours with a *full yellow*. This thickness of shell may be wanted pretty often. It is a good heavy one for ordinary uses, and can be gotten in a reasonable time. No 24-hour treatment, involving consequently a full night, will be required. Even with the *light red*, it can be done during the working day. However, remember that these experiments are based on the packing material indicated by recipe No. 4; that is, by a mixture of 6 parts, by weight, of powdered wood charcoal, with 4 parts, by weight, of barium carbonate.

Shell Thickness

Guillet went further with the experiments with this No. 4, and ascertained the length of time required for thicker shells when the *full yellow* heat was employed. For a shell 0.08 inch thick 6 hours were required; and, for a shell 0.10 inch thick, 8 hours.

It may now be seen that an 8-hour period is long enough to give about 1/16 inch in thickness of shell, even at the low heat of a *light red*; and 1/10 inch at the *full yellow* heat.

It is necessary now to explain how the periods of time are to be counted and some facts as to the boxes and the thickness of the packing in the box. The period is to be counted from the moment the *box* has reached the *light red* or the *full yellow*, as the case may be. It is not necessary to wait until the work itself has reached the required heat. Second, the boxes are to be assumed to be made of sheet iron. I do not know the thickness of the metal. Steel is to be counted as just the same as iron.

Third, the diameter of the box is to be assumed as 4.8 inches, the shape being cylindrical. Accordingly, it will be all right to use a steel tube of the 5 inch size. Fourth the articles are to be assumed as placed one above the other, a proper layer of packing material in between, of course. Fifth, around the articles a 2-inch thickness of packing material is to be assumed.

Now, if the reader wants to duplicate the results gotten by Guillet, let him think over the matter well enough to make sure that he is complying with the specifications. The packing material is a mixture conforming to the No. 4 recipe. It is supposed to be powdered. The reader is not to think that everything will be all right, if he makes up the mixture and has it in granular form. Powder is the thing. Then it should be dry when he

packs it in. If he is going to put packing material in that is not quite dry and consequently rely on the heat of the furnace to drive off the moisture, he will probably find that the mud of fire clay used to seal the box will be cracked. This might very well create a complication.

The proportions specified are to be carried out—6 of the powdered charcoal and 4 of the barium carbonate. These parts are to be *weighed*, not measured nor guessed at. Then the mixing is to be done in a thorough manner. Other requirements and specifications have been enumerated. If he does everything just as required, he may expect the same results that Guillet got; but if he changes this and that, he may not be able to get the depth of shell in the proper time, or not get the proper kind of shell at all. In short, the person who desires to do the case-hardening right and to get the shell in the right time, must not monkey with the directions.

Receipt Number 5

If one must have quick action, however, No. 5 will give him what he wants:

5. Powdered coke. Mineral oil (heavy).

These ingredients are to be mixed in such way that the coke is simply thoroughly saturated with the oil. This is said to be a very rapid packing material, producing in 2 or 3 hours a thin shell of high carbon steel. The higher the temperature used, the higher the carbon percentage. In the 2 or 3 hours, one may expect a shell containing carbon in percentages ranging from 1.50 to 1.80 per cent, varying with the temperature. This packing material gives up its carbon quickly.

Prolonging the time in the furnace will probably not deepen the shell satisfactorily. But, if what one wants is quick action and is satisfied with, say, a shell thickness of 0.01 inch, then this is a very suitable material to use. This quick-action packing material is not recommended for articles that are to resist shocks. But if friction is the thing the article has to resist when in service and there is no exposure to shocks, then No. 5 is a suitable article. The trouble seems to center on the very high carbon shell having below it a comparatively soft metal, and the change from the one to the other being very sudden.

Other Receipts

Here are some more recipes for packing material. It should be noted that all the recipes, except perhaps Nos. 1 and 2, have somebody back them. I am not giving freak mixtures and mixtures having nobody of weight back of them. Nos. 1 and 2 are perhaps exceptions. They are possibly all right.

6. Powdered wood charcoal 10 parts
Common salt 1 part
Sawdust 15 parts

7. Coal (with 30 per cent of volatile materials) 5 parts
Charred leather 5 parts
Common salt 1 part
Sawdust 15 parts

8. Charred leather 10 parts
Yellow prussiate of potash 2 parts
Sawdust 10 parts

The slowest of these three is No. 6; the fastest, No. 8. Sawdust occurs in all. Its advantage centers largely on the fact that it makes the whole mass of the packing material porous. This seems to be advantageous, because it allows the gasses that form to get through to the work. The "30 per cent volatile materials" means that when the coal is heated, as if to make coke, it will lose 30 per cent of its weight. Probably, the generality of freely burning soft coals have this much volatile matter—that is, matter that will pass off, though the coal is not exactly burnt. The usefulness of the common salt does not appear to be well understood. However, it does seem to be useful.

I now quote from Prof. Federico Giolitti's *The Cementation of Iron and Steel*, as translated from the original Italian by Prof. J. W. Richards, and Dr. Chas. A. Rouiller: "As I have already said, there are in use, in machine shops, numerous mixtures of the most varied and complex composition. The results of accurate and precise experiments do not justify, however, the use of such complex mixtures, which do not furnish results superior to those which are obtained with the less complicated cements [packing materials]; and, further, because of their complexity, do not furnish results which are constant or uniform and can be exactly predicted. The best and surest results are always obtained by using the simplest cements" (P. 265).

Simplicity Is Advisable

Perhaps, my readers, or some of them, will welcome a further translation, at least of a part of what is quoted. Prof. Giolitti is against packing materials containing *many* different kinds of ingredients. He favors a packing material made from a *few* substances. He objects to the complicated ones, because it is doubtful whether better results are obtainable with them than with competitors that consist of only a few ingredients. Then, when a complicated packing material is used, there is doubt whether it is always the same when made up upon different occasions. This would lead to uncertainty as to what would happen in the furnace. The idea is that it is easier to know what you are doing if your team contains only a few horses. If you have a 12-horse team to drive, things may get balled up. With a sample packing material, there is a good chance of getting it the same when it is made up fresh. This leads to a better chance of producing always the same results in the furnace.

(To be Continued)

The Oil Pumping Engine

The Reason and Remedy for This
Trouble Which Is Almost Universal

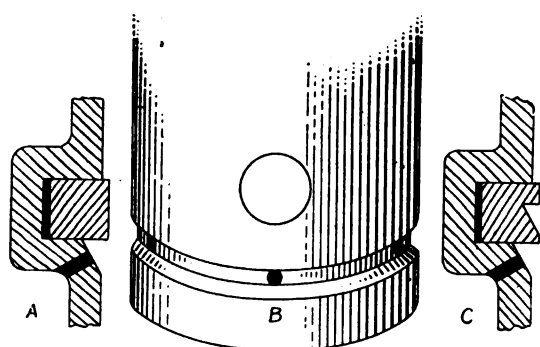
By H. A. Mumford



OIL pumping, which really refers to the leakage of oil from the base of the engine into the firing chamber, is an evil which seems to be growing more pronounced as time goes on. Just why this is so is hard to say but I have always contended that the present day fuel is responsible, though the design of the internal combustion engine is somewhat conducive to the pumping of oil.

When some bright engineer discovers a way of effectually sealing the pistons against leakage, the majority of engine troubles will vanish. This may seem to be a broad statement to make, but when one considers that the majority of engine troubles is due to carbonization in the combustion chamber and the dilution of oil in the engine base, this statement seems more believable.

Obviously, it is necessary to have a comparatively tight piston in a cylinder or the engine will not operate.



Illustrating Various Methods of Boring Pistons To Prevent Over Oiling.

The tighter the piston, the more efficient the engine. The best way we know, at the present time, of making a tight piston is by the piston ring method, crude perhaps, but fairly efficient so long as the rings are properly fitted.

The difficulty which arises in fitting rings is not so much to fit the rings to the cylinders as to fit the rings to the pistons. If the operation of the engine depended upon a ring to cylinder fit, our troubles would be small because it would be an easy matter to lap the rings into the cylinders and thus secure a gas tight fit which would last as long as the engine.

But our main trouble arises when we try to fit the rings to a piston groove. In order to work efficiently the ring must be free to expand and contract against the cylinder walls, as the latter are distorted by heat. The ring must be free to expand lengthwise or it will bind, hence a joint in the ring is necessary. But it

must also be free to expand widthwise as well as from front to back, and this is the big, almost overwhelming problem.

If the ring is fitted to the groove with a sliding fit while the piston and ring are cool, then the ring will surely bind when the assembly is heated and the engine is running. If the ring binds in the groove it will not expand against the cylinder walls and therefore cannot do its duty.

An Excellent Valve

On the other hand if the ring fits loosely in the piston it will form the prettiest little valve for oil pumping that one could install on a piston. Stern fate admits of no error in piston ring fitting and here specification is accuracy only. Modern engineering practice suggests that if there is to be an error, and there must be one in the majority of cases, then let that error be on the side of looseness of the ring, rather than the opposite; hence the oil pumping piston.

"But why should a piston pump oil upward, rather than downward?" is a logical question to ask at this point. To effect a cure, or a partial cure, we must understand the conditions which lead to the trouble, therefore let us consider this question.

If an engine pumps oil, the rings do not fit the pistons. This is a fact, not a theory and to carry the statement further I might say that the rings must have an up and down movement in the grooves. With this fact as a basis let us follow out the conditions.

As the piston moves downward on the power stroke a certain amount of base compression results, slight but even so is greater than the pressure back of the ring. This results in the forcing of some oil behind the ring in the space of the ring groove between the ring and the piston.

The second that the piston starts upward on the exhaust stroke, the opening around the bottom of the ring groove is closed by the friction of the ring against the cylinder wall. Oil is thus trapped behind the ring with its only escape toward the top. And now let us digress for a moment.

Carbon Formation Works Downwards

It is an easily demonstrated fact that the carbon formation in a gasoline engine starts in the explosion chamber and works downward. It is obvious, therefore, that small, free particles of carbon will usually be precipitated upon the upper surfaces of the rings and washed off from the lower edges, hence the ring will not form a

perfect seal at the top, even though it often does at the bottom.

With any carbon particles between the top edge of the ring and the piston groove, the oil which is behind the ring can escape upward and is assisted by the vacuum of the intake stroke.

On the compression stroke some of the oil is normally thrown back into the groove, but enough has escaped into the cylinder to cause trouble.

Now there are several ways of preventing or alleviating the oil pumping action. Assuming that it is humanly impossible to fit a ring to the piston, we must do the next best thing, drain the oil from behind the ring.

Lower Ring Is Chief Offender

It has been found by experiment that the lower ring groove is the chief offender. Naturally if the excess oil is prevented from going above the lower ring, then the oil pumping action will be lessened materially.

In our sketch at B is shown a simple method of repairing pistons. The lower edge of the groove is beveled slightly, so as to have about a $\frac{1}{8}$ inch face and the oil drainage holes are bored through the metal behind the ring. The oil holes should be spaced about $1\frac{1}{2}$ inches apart around the circumference and as near the bottom edge as is practicable. The size of the holes need not be over $\frac{1}{8}$ inch in diameter. The holes should slant downward in the same way as the ones shown, at A and at C.

This is an old method, cheap and quick, and though it is fairly good, it can be improved upon. We have found that there ordinarily would be a certain amount of oil forced behind the lower ring, but if this oil can be prevented from going behind the ring, then more is accomplished than the simple draining of the oil from the groove.

At figure A is shown the improved method of oil

pumping prevention. The sharp edge of the ring tends to scrape the oil from the cylinder walls, the flat surface of the ring tends to hold back the oil and the beveled edge of the piston groove with its drainage holes drains the oil downward and away from the ring. In this case as well as the one illustrated at C, the beveled edge and the size of the holes should be the same as described for B.

Of late there have come upon the market a number of patented rings, and since there are a large number in which are incorporated oil sealing grooves we illustrate at C one type of rings of this kind. In installing this type of ring the same procedure outlined for A and B should be followed and it is vitally important that the ring be installed right side up as illustrated.

THE FOUR STROKE CYCLE ENGINE

FOR the benefit of our readers who are struggling along with the idea that a four cycle engine is so termed because it has four different actions known as intake, compression, firing or power and exhaust strokes, I'm publishing this short article. It really galls me to read about "the four cycles of the gasoline engine."

The term "four cycle" is incomplete, the correct reference is "four stroke cycle," which translated into simple language means that four strokes are necessary to complete the cycle of operations. The complete "cycle" of any gasoline engine consists of four things and in our illustration we have likened these four operations to the firing of a gun.

First comes the loading of the gun which is similar to the intake stroke of the engine; next comes the cocking of the gun which really means the compression of the spring behind the trigger, an operation which is like the compression stroke of the engine. Next fol-

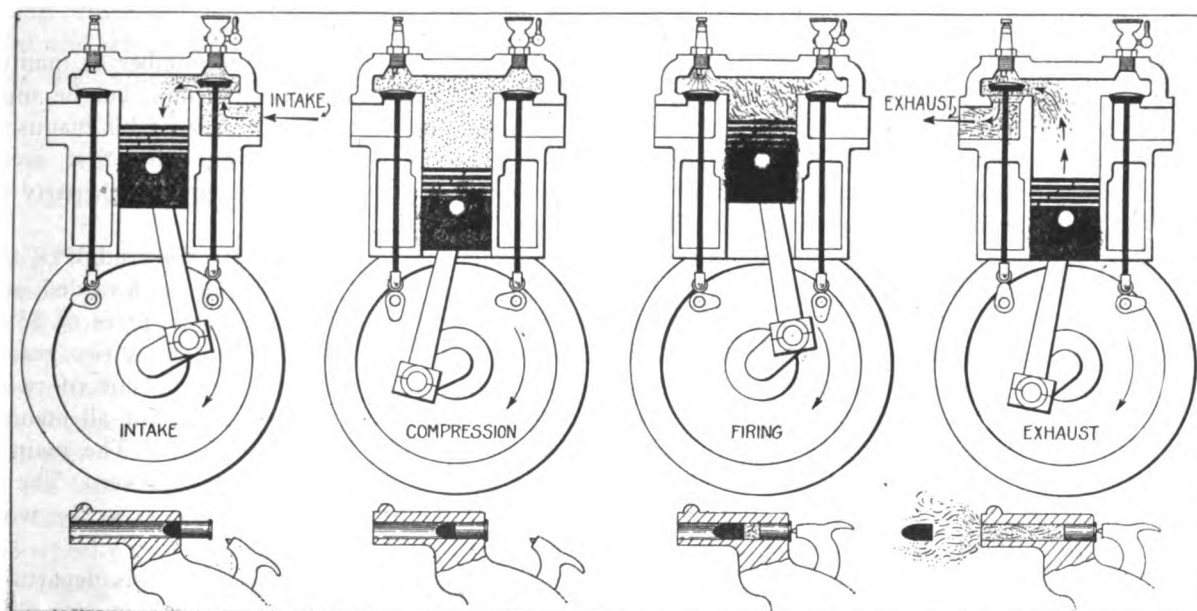


Illustration Showing a Comparison of the Engine Cycle with the Loading and Firing of a Gun.

lows the firing of the gun, similar to the firing stroke of the engine and finally the ejection of the spent gasses and the removal of the cartridge, which represents the exhaust stroke of the engine.

In the two cycle, or more correctly the "two stroke cycle" engine the four operations of intake, compression, firing and exhaust, take place in two strokes of the piston. The stroke downwards is divided into two parts, the first part is devoted to the firing or expansion of the burning mixture; the second part is devoted to the exhaust. As soon as the exhaust gasses pass through the open port a second port opens and the intake gasses are admitted.

When the piston starts upward again all ports are closed and so compression starts. The whole cycle of operations being included in one down and one up stroke

of the piston.

It would be possible, though not practical perhaps, to have a six, eight or even ten stroke cycle engine. In such a case, a six cycle engine for instance, one stroke would be devoted to power, the next up stroke to exhaust, the next down stroke nothing in particular, the next up stroke to further exhaust and the next two following to intake and compression respectively. In an eight cycle engine, two of the up strokes could be utilized for exhaust; two down strokes for intake and two strokes would be wasted.

But in every case remember that the word cycle refers to the complete operation necessary from firing to the next power stroke and that the number always refers to the number of strokes necessary to complete the cycle of operations.

Your Workshop Experiences

We Will Pay You to Tell Us About
Clever Repair Jobs You Have Done



FOR a long time we have felt that our readers would be greatly benefited by a more comprehensive interchange of ideas. We are proud of the fact that our magazine circulates to all parts of the world where the English language is spoken. This being the fact, it follows that there are hundreds of methods of making automobile repairs, of doing mechanical repair work and of handling machinery which may be practiced by many readers and which may be entirely unknown by others.

A reader in Africa, limited perhaps in his choice of repair tools is forced to make a tool for a special job. Necessity being the mother of his invention, it is possible that the tool which he makes may be of far more utility than those which we have in this country. Were he to publish his idea in our magazine it would work to the benefit of hundreds, perhaps thousands of our readers. With due amount of co-operation and appreciation our other readers could give us hundreds of ideas which the African subscriber could use to his advantage. The African reader would give one idea and reap a harvest.

To make the whole scheme a success it is necessary that every reader co-operate with us. We will do our part and to this end we hereby announce a series of prizes to be awarded for those who send us ideas.

The prize contest, or experience exchange, as you may wish to call it is to be divided into four groups, so comprehensive that an opportunity is offered for every reader.

In submitting the articles or manuscript only one side of the paper should be used. Manuscript should be typewritten, if possible, though legible long-hand will be entirely acceptable. Each article will be limited in

length to 300 words and must be relative to the particular subject which we have suggested. If a return of the manuscript is desired, proper postage must be enclosed.

All manuscript should be addressed to, Prize Contest Editor, Automobile Dealer & Repairer, 16 Hudson Street, New York City, N. Y.

The contest is open to all readers of this magazine and will close on December 15, 1922. All envelopes containing manuscript must show a mailing date not later than midnight, December 15, 1922. The prizes will be announced on the opening day of the New York Show and the names of the winners will be published in the January 1923 issue of this magazine. The prize winners will be chosen by a board of judges consisting of the Editor and the Manager of this magazine and a third person chosen by these two.

No reader is limited as to the number of manuscripts submitted or to any particular group, but he must put his name on the back of each page of his manuscript.

In case of a tie for the prize, either first, second or third, an equal prize will be given to each party so tied for the prize.

It will be noted that there are four subjects, one for each group. Three prizes will be awarded in each group; a first prize of \$10, a second prize of \$5, and a third prize of \$3. In addition to this a two years' subscription to this magazine or an extension of two years to regular subscribers, will be given for all manuscripts which are published in our columns. The main prizes to be in addition to the subscriptions given. The Editor of this magazine is to be the judge as to the worth of articles to be published.

Since it is our intention to make this department of as much value as possible to our readers, we will publish all such manuscripts as are in our opinion meritori-

ous, so that practically everyone who submits a good idea in manuscript form, will be reimbursed for the trouble in the shape of a two year subscription to our magazine.

Since it is desirable that the ideas be made as clear as possible it follows that any sketch or photograph which illustrates the subject will be considered favorably. The merit of the idea is the one thing which is to be judged upon when awarding the prizes, hence no one need worry about the choice of words or the use of English. We will edit the manuscript and prepare the illustrations if necessary.

Group. 1.

Manuscripts in this group are to be devoted to the subject of general automobile overhauling insofar as mechanical working parts are to be considered. The removing of a dent from a mud-guard, the patching of a fender, a repair to the frame, an axle, or to any of the working parts. The ideas must be out of the ordinary and not merely jobs which are so obvious as to be common practice.

Group 2.

Manuscripts in this group are to be devoted to the subject of automobile electrical repairs. How you located and repaired a particularly obstinate trouble. The field is broad on this subject and may cover starting, lighting or ignition.

Group 3.

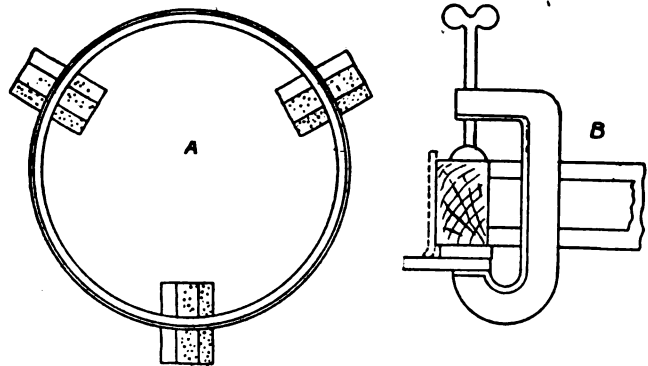
Manuscripts in this group are to be devoted to the subject of tire and tube repairs, vulcanizing and similar work.

Group 4.

Manuscripts in this group are to be devoted to the subject of special tools which you have made, tools which are different from those on the market and which answer the particular purpose better than others, or are cheaper.

But, no. Take the wheel and felloe out in the yard, far enough away from buildings and oiliness so there is no fire risk. Secure six bricks, ordinary bricks if no fire bricks are at hand. Space these bricks at three points, in piles of two each, placed on edge, and lay the felloe band on them. Then build a wood fire all around, under the band, just as you would when camping, and turn your attention to the wheel. Hurry too, for if you are a good fire builder, the felloe will be red hot by the time you get the wheel blocked up off the ground in such a position that the felloe can be dropped over it in a jiffy.

It is necessary to have a gauge, or stops, to properly



locate the felloe as it is slipped on the wheel. These can be three little pieces of metal held on by C clamps, as shown in the illustration. Before setting the latter, the proper amount of overhang has to be determined or else the new felloe will space the tires too far in or out.

Setting felloe bands or changing them is a job that has to be done when wheel changes are made. It is not always necessary to get a whole new set of wheels when a different kind of tire fastening is desired: changing from clincher rims to some form of quick change rims taking the same size of tire involves the getting of smaller wheels or of turning down the old wheels and shrinking on new bands. Before getting new wheels, the owner should ascertain the prices on them and on the parts alone. If the latter are much cheaper, then measure up the wood wheel—if only a quarter of an inch or less has to be turned off the wood, the application of new felloe bands is so simple that it need not stand in the way of making that kind of a change.

REPAIRING WOOD WHEELS

SHRINKING on felloe bands is not a common job in automobile repairs but it does have to be done at times. Most mechanics have shrunk on small collars and other pieces that were required to be a tight fit upon a shaft or mandrel; and they have probably seen locomotive tires shrunk on wheel center in the rail road shops; in the former case, the piece was heated in any small fire—in the latter, special appliances were used to heat the steel band several feet in diameter before placing it over the wheel center to cool. And so it is but natural that the average person concludes that an automobile wheel felloe cannot be put on properly without special tools for the job.

CLEAR AS MUD

A tourist reports seeing the following police regulations posted up in Ireland:

"Until further notice every vehicle must carry a light when darkness begins. Darkness begins when the lights are lit."

Illusion Shattered

Stage Hand (to manager): Shall I lower the curtain, sir? One of the livin' statoots 'as got the 'iccups!

—*Passing Show (London).*

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always pleased to re-send numbers which have gone astray in the mails.

All communications should be addressed to the New York
City office at 16 Hudson St.

Work Shop Experience Prize Contest

WE WANT to call the special attention of our readers
to the announcement in another part of this maga-
zine, explaining a proposed Work Shop Experience Prize
Contest.

Your editor has believed for a long time that we ought
to permit our subscribers to take a more active part in fur-
nishing reading matter of an interesting nature and this
prize contest is a definite effort in that direction.

Cash prizes amounting to a considerable sum will be dis-
tributed among our readers and in cases where contestants
are unable to win any prize we have arranged to compen-
sate the writers in another way.

For every one of these short articles which are received
and published, even if no prize is awarded, we will present
to each writer of such articles a two-year subscription to
this magazine, for any friend who may be actually en-
gaged in the repair trade whether that friend is a shop
owner or a practical mechanic.

If the writer of any article prefers it, however, we will
present him with an extension of his own subscription for
a period of two years beyond the expiration period of
his subscription as entered on our circulation books.

Many of these articles will be published in the next few
months and the prize will be awarded at the time of the
New York Automobile Show.

By consulting the announcement in another part of this
magazine it will be seen that the prize articles can cover a
wide variety of mechanical subjects, so that almost any
person who has had practical automobile experience is
likely to be a successful contestant and win one of the
prizes.

These prizes will not be awarded on the basis of literary
merit, but entirely on the mechanical and practical value
of the information contained in the article furnished for
our columns. No one need hesitate to enter the contest
because he lacks school or college education; and the cor-
rect use of English is not by any means necessary.

Articles will be made much more valuable if the con-
testant will furnish rough drawings or diagrams, showing
just how the particular job described, was accomplished.

Each article will be limited to 300 words and the editor
of course, reserves the privilege of making any desired
changes in the articles before publishing.

Anyone desiring to have his manuscript returned must
send return postage, and it is understood that we have the
privilege of publishing any articles sent in, under the rules
of the prize contest, without any compensation to the
writers, except the subscriptions to our magazine and the
prizes to those who are fortunate enough by the merit of
their articles to win such prizes.

Writers will confer a favor by cooperating with us in
sending in articles regarding work-shop experience. Each
contestant is **not limited to a single article**, but can send in
as many of these articles as he wishes.

Our Trouble Department

WE are not receiving from our subscribers as many
letters addressed to our Trouble Department as
we would like to get.

We desire to make this the most interesting feature
of the AUTOMOBILE DEALER AND REPAIRER, and we are
not only willing, but anxious to answer all practical
questions of a mechanical nature promptly and accu-
rately.

The automobile repairshop industry in the last few
years has grown to enormous proportions, involving
millions of dollars of capital and no doubt many of our
readers, whether they are car owners, mechanics or re-
pairshop proprietors, are constantly running up against
perplexing mechanical problems which our technical
editorial staff would be only too glad to solve.

The readers who send in questions for our Trouble
Department are requested to enclose return postage and
except where investigation and research may be neces-
sary, a very prompt reply will be sent out to all such
inquiries.

We desire practical questions in all the mechanical de-
partments of the industry including tire repair work,
welding and we also desire to assist our readers in
solving electrical difficulties of all kinds.

There are various books published containing wiring

diagrams, but no matter how complete these books are supposed to be, they do not contain everything of this nature, and it is also true that these books may not be easy of access to some of our readers.

We have published a great many wiring diagrams and will continue to do so.

We hope that this appeal will have the effect of adding greatly to the number of inquires for our Trouble Department and we invite the earnest co-operation of our subscribers to make this department an even more interesting feature than it has been in the past.

Fair and Moderate Charging Brings Success

READERS of this magazine should need not be told that we want to do everything in our power to assist the automobile repair shop proprietors, thousands of whom are our faithful subscribers, always ready to root for us, and are frequently sending us letters of praise and warm appreciation.

The wise repair man, however, should thank us if we occasionally publish a word of warning against the methods of some repair shop proprietors, not many we trust and fast decreasing, whose motto, vulgarly expressed, seems to be—"soak em."

The repairman who puts into his pocket an exorbitant price for the labor and material he has furnished, and then gloats over his ill-gotten gain, is one of the most short-sighted of mortals. He is entitled to a fair and just profit, and no more. If he takes more, the news spreads, and his business is soon headed for the toboggan-slide, which ends in the bankruptcy court.

We are pleased to note, however, the old-time idea, that the car owner is natural prey, is fast disappearing; and the up-to-date auto repair shop is conducted on the same fair and equitable basis, as any other legitimate retail business so should it ever be.

The Garage as an Information Bureau

THE road-side garage, rightly conducted, should be nothing less than a complete bureau of the particular kinds of information which are most useful to the touring car owner, on whose patronage every garage is largely dependent.

Not only the garage proprietor, but all his employees, even to the humblest, should be able to answer the questions of tourists regarding roads, routes, motor laws and all simple technical points, regarding the care and repair of a motor car.

A stock of maps and a fair-sized library of technical books on the automobile should be just as necessary a part of garage equipment as the office furniture and stationery.

Neatly bound volumes of the leading automobile trade and technical, monthly and weekly publications should be placed where visitors can have ready access to them.

Every employee should be trained in courtesy as well as knowledge; and any flagrant breach of courtesy should be the signal for the instant discharge of any employee.

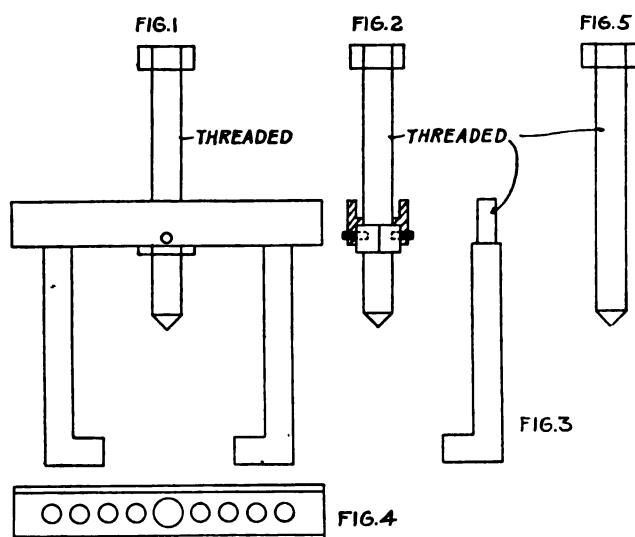
If the above rules are joined to reasonable repair work charges with all transactions on a strictly cash basis, or virtually that, success in the garage business is a certainty, provided the location is fairly good.

A HOMEMADE WHEEL PULLER

By Edwin Kilburn

ALL repair shops often find need of a wheel puller somewhat lighter than the usual heavy ones in use. I have found a home made one very useful which was built as follows:

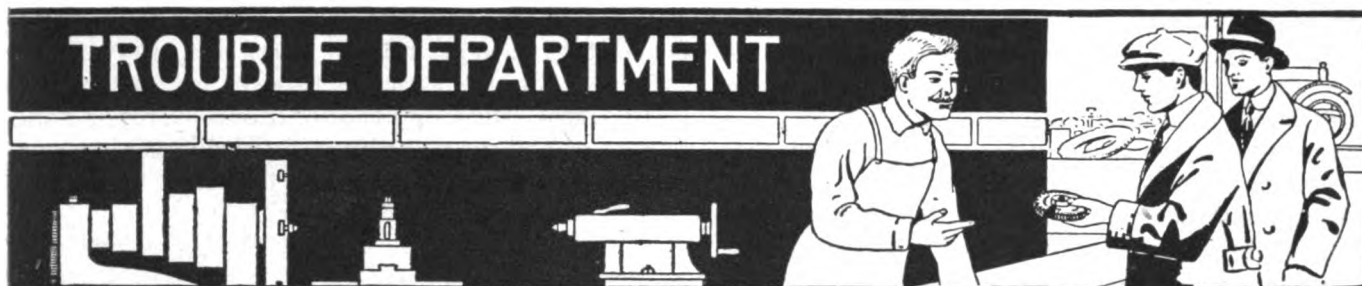
First a piece 9 inches long was secured from a damaged front axle of a Ford. Through the web a series of 9/16 inch holes were drilled as shown in Figure 4, the center hole being drilled 13/16 inches. Next a piece of 3/4 inch diameter cold rolled steel, 10 inches long, was threaded with the U. S. Standard Thread, pointed at one end, the



other turned down to 5/8 inches, threaded, and a nut screwed on and the rod headed over as shown in figure 5.

Then the nut and point were case hardened, after which a nut was fitted to the axle piece as shown in Figure 2 where the screw, nut, and axle piece are shown, the nut being held in place by two machine screws. Two hook pieces were made as shown in Figure 3, being forged out of either 3/4 or 5/8 inch stock, depending on whether they are to be used for heavy or light work. If for heavy, the end where the hook is should be upset, the opposite end reduced to 1/2 inch and threaded as shown. The hook pieces are secured in the proper holes in the main bar as shown in figure 1, as the work being done demands, and the puller is ready for use.

We have used this puller on quite heavy work and have found it very satisfactory. Furthermore, it is an easy matter to make special hooks for it for unusual work, and at comparatively little expense.



Wiring of 1921 Dodge Bros. Car.

3133

From A. S. Durand, Canada: Will you kindly publish the wiring diagram of Dodge Bros. 1921 model car?

Reply: The wiring diagram is printed below, in this column.

Gear Shifter Trouble

3134

From Roy Kurzweil, New Jersey: I have a 1916 Saxon car which has the gear box mounted on the rear axle. When I put my gear change lever into the reverse the car will not move backward, but the gears will grind. What is the trouble?

Reply: Your letter is rather short and doesn't give us much to work upon so we will assume some of the things. We assume from what you say that the low speed forward works all right. Is this correct? At any rate our whole answer is based upon this conclusion.

Suppose you put your gears in low speed forward. By so doing you move the sliding gear on the main shaft forward and into mesh with a gear on the countershaft. The countershaft is running so long as the clutch is in, so the power is transmitted in the following order:

From the engine to the clutch, then to the driving gear in the transmission, then to the countershaft driven gear, then to the countershaft, low speed driving gear, then to the sliding gear which you have just shifted and so right back to the rear axle pinion gear. If this is correct and the car moves forward under low gear you are positive that everything is all right with the rear axle, the sliding gear, the counter shaft and the gearing through to the transmission.

When you put the gears into reverse, this is what happens. You move the sliding gear backward, the same gear which was used for low speed forward, and this gear comes into mesh with another gear called the reverse idler gear. The power should then go from the engine to the countershaft exactly as it did with the low speed forward, but from the countershaft it goes to the reverse idler, then to the sliding gear and then back to the axle. If it does not work under these conditions it means that any of the following troubles may exist:

First: Reverse idler gear teeth broken or idler gear out of place. Reverse gear on countershaft broken or not properly keyed to countershaft.

Second: Shifter arm may not push sliding gear back far enough.

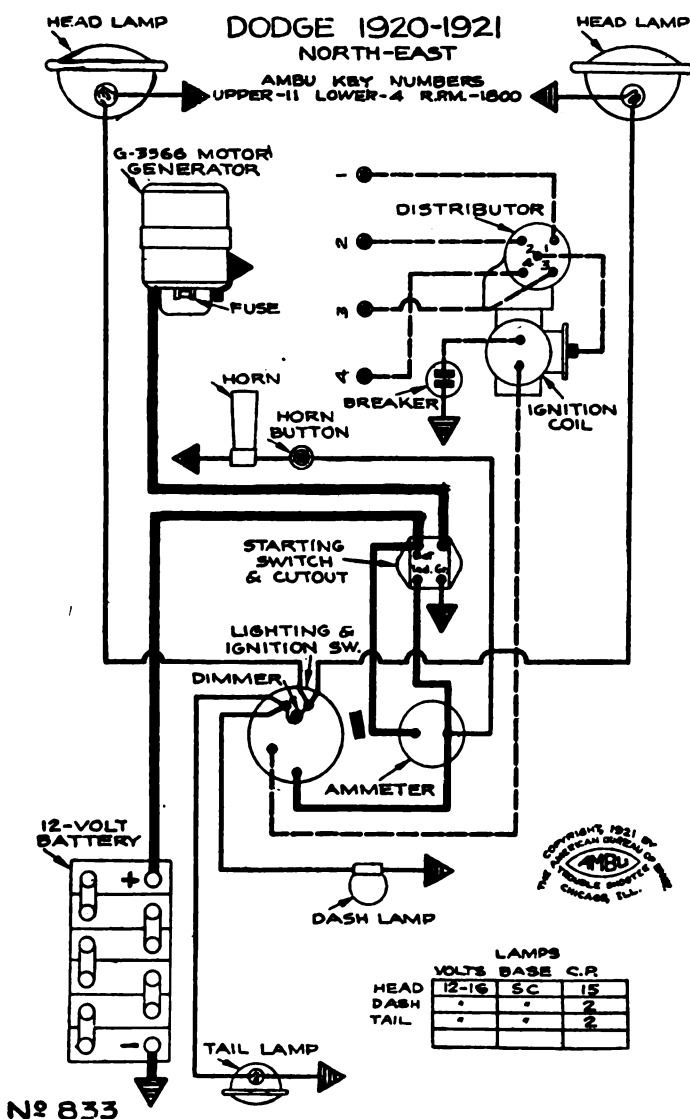
Flywheel Teeth Missing

3135

From R. M. Eckler, Iowa: I have a model K 1917 Grant six touring car, equipped with the Bendix drive. Some of the cogs are gone out of the fly wheel and I should like to know how this can be repaired. Will it be all right to run the car?

Reply: If there are only a few cogs gone from the fly wheel gear and these cogs are not adjacent to each other there should be no trouble with the machine.

The only chance for damage is that you might smash the pinion gear on the turning motor. However, it



might be worth while to take this small chance, because the cost of the fly wheel gear is rather high.

You might run your machine for the next ten years with only half of the teeth missing, and still get by, and on the other hand, however, you might run it for five minutes and smash the driving pinion all to pieces. Usually two gears will run together all right providing there is a piece of the tooth left on one of them and providing two of the teeth missing are not next to each other. If, however, they are next to each other we would advise you to get a new fly wheel gear.

Consult with your repairman before doing this, because he can probably buy a new gear cheaper than you can. Possibly your repair man will be able to weld in a set of new cogs where the old ones are broken.

Generator Trouble

3136

From B. H. Aldrich, Massachusetts: I have an Overland 4, 1921, fitted with an Autolite Generator. Now this generator will not start generating current until I have closed the cut-out points by hand, then it will work all right until the engine is stopped and started again. I am obliged to close the cut-out points by hand every time I start the engine, or no current will go to the battery.

I have taken the generator to pieces and examined it, it has been in the hands of a number of mechanics, the brushes have been replaced with new and the armature is a new one. I have tried several cut-outs on the machine but the trouble seems to remain the same, so I'm sure that the cut-out is not at fault.

After the generator has been in operation a few minutes it becomes so hot that I cannot hold my hand upon it. I have thought that the trouble was in the field coils, but the garagemen tell me this cannot be so.

Reply: All the symptoms which you have mentioned would point toward trouble in the cut-out, but we agree with you that the trial of several cut-outs has proven conclusively that such is not the case.

We feel that the garagemen whom you have interviewed are entirely wrong in their statement that the trouble cannot be in the field coils. Obviously the trouble *must* be in the fields. Taking the two symptoms, overheating and failure to generate, into consideration at the same time no other cause could be possible for the trouble than in the field coils.

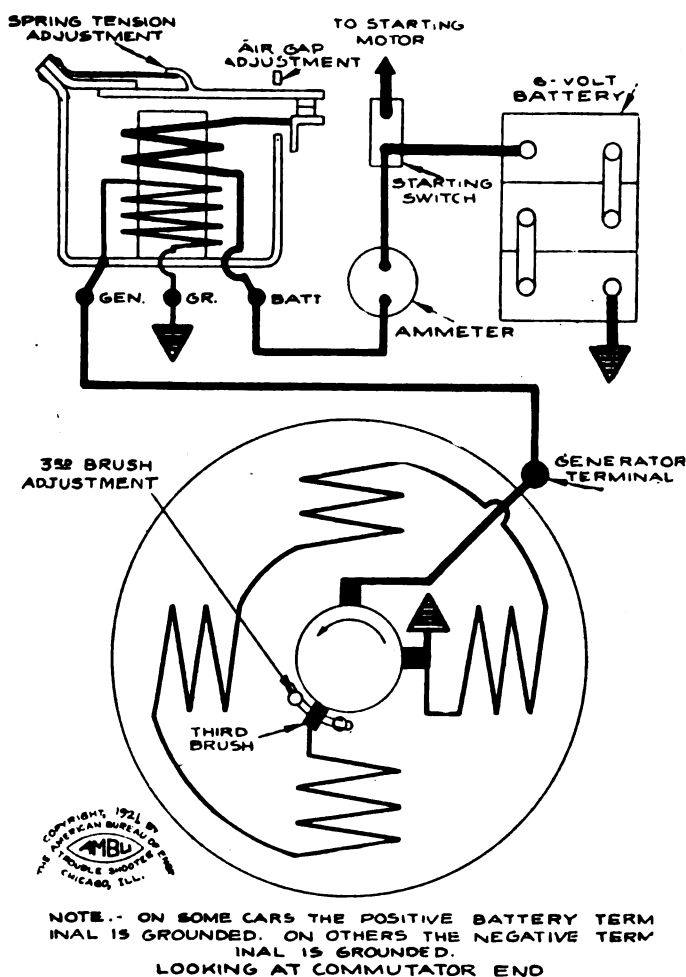
If you will refer to the attached diagram you will see that the internal circuit of your generator is simplicity itself. The exciting current for the fields is taken from the third brush at one side and a main, grounded brush at the other. The two brushes as well as the armature and commutator must be in condition or the field would not be excited, no current would be generated and the unit would not be overheated.

The other main brush must be in condition or no current would pass to the battery even after the cut-out

points were closed. The ground connection must be O. K. or the generator would not send current to the battery. Obviously, then, something is wrong with the fields.

In all probability you will find that one of the field coils is grounded. You can easily test the coils by taking the generator from the car and removing all of the brushes. Make a test outfit by hooking up a light bulb in such a way that when the two test wires are connected they will light the lamp. Connect one test wire with the base of the generator and touch the other one of the field coil terminals. If the light burns, then the

AUTOLITE GENERATORS "GJ" & "GK" CLOCKWISE ROTATION FROM DRIVE END



fields are grounded. To locate the grounded coil cut the connecting wires and test each coil separately.

The other possibility is that one of the field coils is reversed or shorted out of the circuit. Run a current from the storage battery through the assembled unit and place a compass on the outside of the generator. The compass needle should be attracted toward the top pole, reversed on the next, attracted on the next and reversed on the next, showing a change of polarity for each adjoining pole.

If you still cannot locate the trouble it will be advisable for you to send the generator to the factory.

The Battery Overcharges

3137

From A. T. Mumford, Michigan: In the course of my work I drive my car upwards of 10,000 miles each year and it is a vacation to me to be able to put it into a garage and forget it occasionally. Naturally I don't drive the thing for relaxation and consequently it seldom gets onto the road after dark.

My trips are usually fairly long ones and the starter is not used to any great extent. These things all lead to the overcharging of the battery, which laps up water like a dry codfish, and I cannot recall that the specific gravity ever has been below 1.280, which, I understand is the fully charged point for my battery.

Now I'm afraid that the battery will be destroyed by this excessive charging current and would like to have you tell me how I can remedy matters.

Reply: There are two excellent remedies for your trouble and since there are undoubtedly many of our readers who are in a similar predicament, we will go into the subject to some length.

Unfortunately you did not give us the name of your car, so that we cannot determine upon the type of generator which you have. There are, roughly two types of generators, the third-brush type and others. The third-brush type of generator ceases to generate current when the circuit from it is closed or "shorted."

If your generator is of the third-brush type it will be advisable for you to adopt the following scheme. (You can easily tell if it is of the third-brush type by looking at the brushes. If there are three brushes, then it is of the third-brush type.)

If the generator is of the two wire type it will carry two posts, one positive, the other negative; if it is a grounded generator, then one pole will be grounded to the frame and only one terminal will be visible. Mount a switch upon the dashboard and so wire it that it will short-circuit the two poles of the generator, when it is "on." Or, in the grounded system, fix the switch so that it will ground the generator terminal. The shorting should occur as near the generator as possible and at least No. 14 wire should be used, no smaller.

Each morning before you start out you should make a point of testing the battery. From the test you can determine about how much current will be needed during the day to keep it charged and be governed accordingly. Let us explain further.

Suppose you test the battery, (assuming it to be a 120 ampere hour capacity unit), and you find it to be fully charged. Then you will need to replace only the current which will be used during that day for ignition and starting. A glance at the ammeter while the engine is running at its lowest speed will show how much current is required for ignition. Let us suppose it to be 5 amperes.

The ignition current requirement, for a ten hours run, then will be 50 ampere hours. Suppose you find it necessary to start the engine ten times, and it takes $\frac{1}{4}$ of a minute each time to start it. On the average it requires about 120 amperes for the starting motor. Ten

starts would require 120 amperes for about 3 minutes total, or $\frac{1}{20}$ th of an hour which would mean about 20 ampere hours to be added to the 50 ampere hours required for ignition, making a total of 70 ampere hours necessary for the day's run. It won't pay to figure any closer than this, and if the engine is to be started more than 10 times, the battery will need some charging during the day.

For the first five hours of the run, then, turn the switch "on" so as to stop the generator from charging at all. For the next two hours turn the switch "off" and let the generator put a small charge into the battery; switch it "on" again for an hour or so and wind up the day by allowing the battery to charge again.

After a little practice and a bit of careful estimating you will be able to keep the battery fairly well exercised and prevent any excessive overcharging.

Our second suggestion is mainly for those machines which are not of the third-brush type, though it can be applied to third-brush generators equally well. This idea is, perhaps, a little more costly than the previous one but it is darned convenient because you can control to a nicety the amount of current going into the battery.

At practically every supply house where wireless apparatus is sold it is possible to obtain a small rheostat, 10 ohms resistance, fitted with an ornamental knob and heavy enough to stand a heavy current almost indefinitely.

Mount this rheostat inside the dash panel with the knob outside, connect the two terminals of the rheostat across the generator line between the generator and cut-out if possible. If it is not possible to make such a connection, then it is permissible to connect it across the battery, but if this is done you must remember to turn it off at night or the battery will be entirely discharged.

This rheostat, connected in this way, forms a safety valve for the current and you can draw off as much current as you wish. When the rheostat is set with its full, 10 Ohm resistance in the circuit it will draw off only $\frac{6}{10}$ or $\frac{3}{5}$ of an ampere.

You can start the engine and while the car is running inspect the ammeter. If it shows a charge, then turn the rheostat knob until the ammeter hand drops back to zero.

The same amount of care and practice is necessary as in the first case described, in attending to the current going to the battery.

Many motorists are in the habit of burning the headlights during long trips, but we feel that the above methods are infinitely superior to such a scheme. Headlights have a limited life and will soon be destroyed if burned all of the time. It is also a fact that a bulb gradually loses its efficiency if it is burned, and the candle power gradually diminishes. The cost of the switch and rheostat which we have described is less than one change of headlight bulbs, and the switch or rheostat will last as long as the car, properly used.

Wiring of Kissell, 36-4 Car

3138

From R. E. Perkins, Vermont: Will you kindly give me the wiring diagram of the Kissell Kar, 1915, Model 36-4? This car was equipped with the Westinghouse system.

Reply: The Wiring Diagram you request is printed at the bottom of this page.

A House on Wheels

3139

From D. E. Lamon, Wisconsin: I wish to take a truck chassis, cut the frame and lengthen it. This will carry the rear axle backward and of course it will necessitate the lengthening of the driving shaft, which I am prepared to do. I want to put on a special body which is to be a regular "house on wheels," and which I can use for camping and to live in while I am touring.

I have planned to make the body 18 feet long, inside dimension. That is to say, I want to have an 18 foot space between the dash and the inside of the rear. If it is not asking too much will you kindly give me answers to the following questions which have arisen in my mind?

1. Is it possible to extend an auto to an 18 foot body length without putting undue strain upon the chassis?

2. What wheelbase would you suggest for an 18 foot body?

3. What big difficulties, if any, would I encounter in

the operation of a car of the length necessary to carry such a body?

4. As a rough guess what horsepower would be required to drive the outfit at say, 30 miles an hour, or better in a pinch?

5. Do any of the States have laws against trucks of this length?

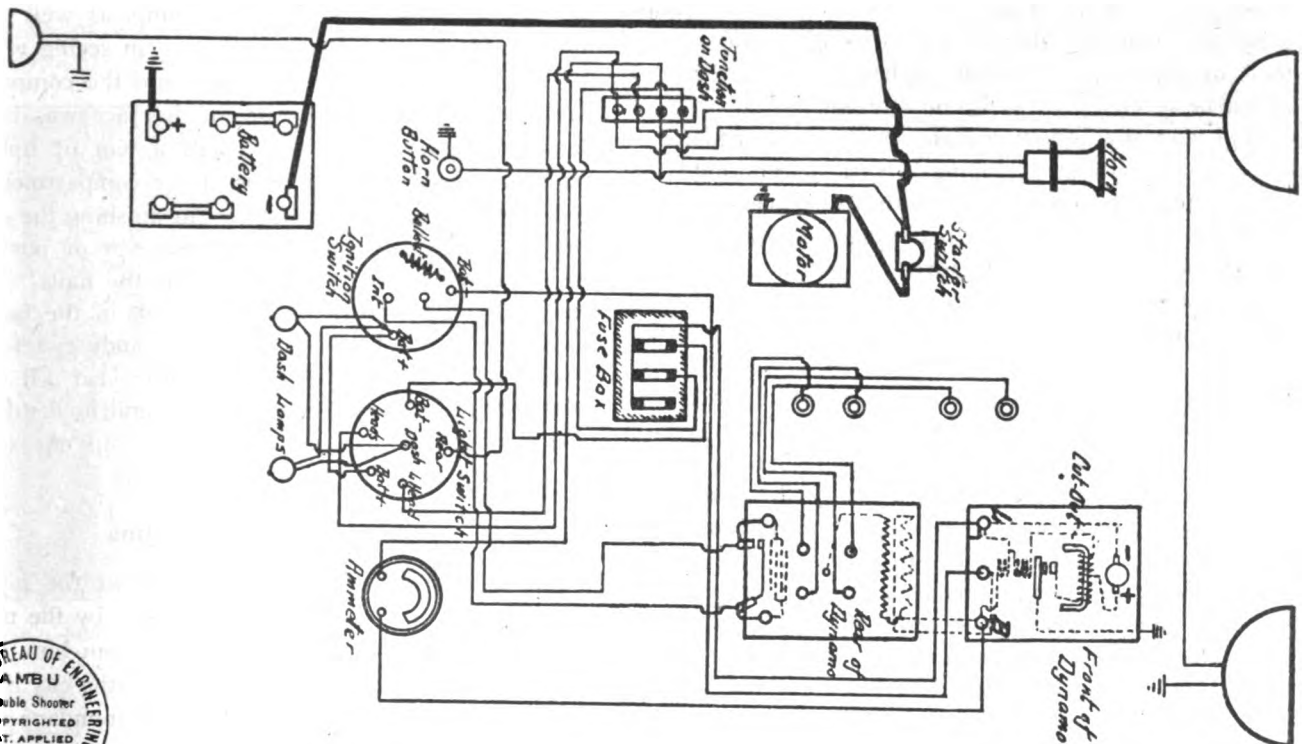
6. If so why?

Reply: We will answer your questions in the order given in your letter.

1. It is possible to extend an auto body to a length of 18 feet behind the dash. The Packard 4-4½ ton truck is fitted with a 18½ foot body and has a 15½ foot wheelbase.

2. The wheelbase will, to a great extent determine the turning radius, though the distribution of the load is the main thing to consider. If the center of gravity of the load is well forward the wheelbase may be shorter than were the main load at the back. For an 22-23 foot truck, which will about allow for an 1 foot body, the average wheelbase is between 14 and 15 feet.

3. The main difficulty you would encounter would be in the turning of corners. With a 14 foot wheelbase you would need 61 feet diameter to turn in. With wide streets the difficulties would be greatly reduced but on country roads, it would be extremely hazardous, both to yourself and other traffic, to take any sharp corner at any reasonable speed. In an ordinary country road, just wide enough for two cars, as many such roads are, you could not turn a right-angle corner without occupying most of the road and a part of the ditch. The

WESTINGHOUSE Kissell 1915 "36-4"

only other real difficulty would come in the housing of the truck, few garages have proper facilities for the storing of such long machines.

4. Your fourth question is an impossible one, both from the standpoint of safety and practicability. A speed of 30 miles an hour with such a vehicle as you have in mind would be double that of safety. It would be a menace to all other traffic on the road and were you to encounter a curve at that speed you would be absolutely unable to negotiate it. A truck of that size should not be driven over 15 miles per hour. You would not be justified, from a stand-point of economy, to install more than from 30 to 40 horsepower engine. Such an engine should drive the car from 12 to 15 miles an hour on the average.

5. Not that we know about. States are in the habit of regulating the length of trucks, though many States have a maximum width law. There is also a limit placed upon the tonnage in relation to the tires. This latter point, however, is usually covered by the manufacturers of the truck chassis.

6. The answer to this is contained in answer. 5.

We would advise you to obtain the truck body and chassis specifications of several of the larger trucks, from 4 to 5 tons capacity, note the maximum widths, weights permissible, sizes of tires, etc. and be guided thereby.

DIGGING FOR REPAIR MATERIAL ON THE SEA SHORE

(Continued from Page 24)

aid. You locate the trouble and casually ask for a cotter pin, a wrench, a pair of pliers or some such simple thing and you find that he has nothing in the way of tools or supply parts except, perhaps, a broken wrench or maybe several rusty nails and a broken bolt or so.

If I had my way I'd make it a capital offence to drive a car without equipping it with a "first-aid" tool kit. Instead of setting the Government officers to hunting for booze I'd set them to corralling unequipped cars and when they caught a motorist whose car didn't even boast of a spare spark plug I'd let them take the offender, put him under water for two days, hang him up by his toes two days and then take away his driver's license. Having given the fellow his lesson, I'd let him loose upon the community again with the feeling that he wouldn't be guilty of the same offense a second time.

Speaking seriously, however, I really think that the man who drives a car, not equipped to make ordinary roadside repairs, deserves severe criticism. It is surprising how few drivers really anticipate any trouble and how much they depend upon the good nature of their fellow drivers. I figure, conservatively, that I have a slight ownership in at least 100 cars sprinkled between here and Maine, for I have donated at least that number of cotter-pins, nuts, lock-washers, bolts, pieces of wire and tape and tire patches.

But I nearly forgot one interesting, amusing and highly instructive episode in my trip back. Just outside of Hartford I passed a new car drawn up beside the road, the owner was evidently deep, deep, deep down in the mouth. He sat on the running board with his head in his hands and was so utterly despondent that I felt I would be saving him from suicide if I stopped and helped.

When I found that the trouble was nothing but a puncture, left rear wheel, I was tempted to laugh at his worry and drive on, but he detained me more to relieve his mind and have someone to confide in. He had owned the car for only two weeks and was about convinced that the devil and all his imps were on his trail. He had accumulated an aggravating score of ten punctures in that time.

The thing had gotten on his nerve, for practically every time he took the car out he had picked up a puncture, and nine of the ten punctures had been in that left rear tire. The other puncture had been in the left front and he said he had picked up a tack, that time, just as he was backing from his garage.

A Badly Abused Tube

The left, rear tube looked like a badly freckled neck. It seemed to me that something must be wrong. I'm not superstitious as a rule but nine punctures in one tire, ten on one side, and an average of one for each 20 miles is almost supernatural. No wonder the poor man was discouraged. He didn't have any more patches with him, his spare tire was at flat as a punctured balloon so I donated a patch to the cause and helped him fix the tire.

In the course of the work he removed the back seat, underneath which the jack and pump, as well as other tools, were stored. Being interested in seeing what sort of equipment he carried I looked into the compartment, and there, almost staring me in the face was his Jinx, in the camouflaged shape of half a pint of upholstery nails, sprinkled over the floor of the compartment.

I suppose that the upholsterer, in finishing the car, had neglected to clean out this compartment or possibly he had unintentionally spilled a box of the nails! At any rate there were the nails and a crack in the box, near the frame on the left side, formed a handy exit for those little puncture makers. For the next year I'll shudder every time I pass through Hartford and hold my breath waiting for one of my tires to pick up one of these same nails.

The Laying of the Jinx

To say the gentleman was pleased at the laying of the Jinx is to put it lightly. It was only by the most intense effort that I tore myself away from him, I could have had his car, his house and most of the city of Hartford had I wished, but I'm above such mundane requirements.

You can believe me when I say that I took everything

out of my rear tool box and hunted for tacks immediately. I found several, I also found a number in the front tool box and put them where they couldn't find any of my tires or those of any other unfortunate motorist.

I figure that a healthy tack must be an excellent athlete for in the case I have just mentioned the crack in

the tool box was over a foot away from the tire. But the tacks might easily work along a frame member, fall to the running board brace and then drop off directly in front of a wheel. It is easy to see that by the law of averages one out of every hundred would be an acrobat as was proven by this experience.

Assembling Battery Plates

Details Concerning the Use of the Torch for This Kind of Work

By David Baxter



THE modern lead burning torch has been very appropriately called the "little brother of the welding torch" and in fundamental principle is practically the same. In fact the oxy-acetylene torch welder will have little trouble in mastering the intricacies of the lead burning instrument.

His chief trouble will be in remembering that he is handling heat in hundreds of degrees instead of thousands as is the case when employing the regulation welding torch. Where the welding flame has a range of approximately 6300 degrees the lead burning flame generates but a few hundred. Otherwise the two torches are almost the same in point of adjusting and manipulation.

As a matter of fact the name "lead burning" is a misnomer, strictly speaking, because burning the lead is the very thing the operator seeks to avoid the most. He employs every known device to prevent oxidization or burning of the lead, either the filler or the metal of the parts joined. To make a correct bond he endeavors to melt the metals without turning any part of them to oxide. In

In fact a definite line is drawn between the soldering and lead burning processes.

To distinguish the method of joining lead parts from that of other metals, where it is necessary, the word lead could be affixed to the word welding, or placed in between the words autogeneous and welding thus: autogeneous lead welding.

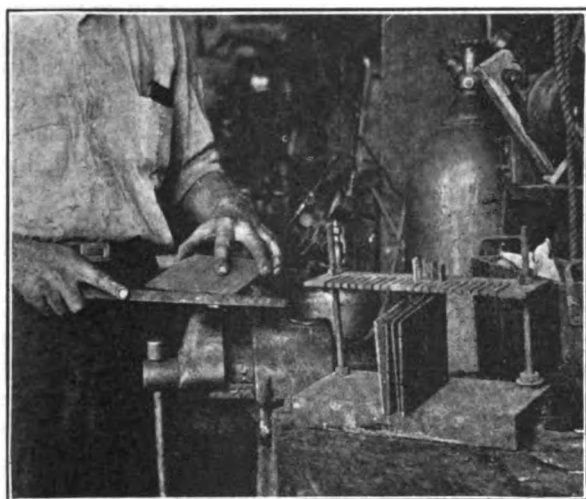


Fig. 1.—Clean All Parts To Be Melted with a Scraper, a File or a Wire Brush.

other words he endeavors to prevent burning the lead. A better name for the lead burning process would seem to be autogeneous soldering, except that in true soldering the metals are not flowed into and mixed with each other.

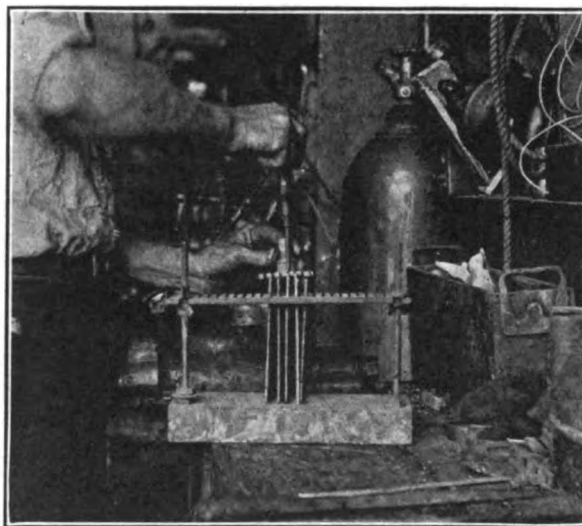


Fig. 2.—With the Plates Arranged in the Spacer, the Post Bars Are Fitted to the Plate Straps.

Lead is not burned during the process if the work is properly done. If any of the lead is burned the result is a defective or inferior job.

However, since the name lead burning has become so closely fixed to the process we will make no attempt to change it in this discussion but will continue to refer to it thus.

Before the advent of the acetylene gas, lead burning was accomplished by means of a flame supplied with hydrogen through one tube and atmospheric air through another, using a pump to force the air through the tube. But the modern lead burning torch now uses the carbon gas or acetylene in connection with tanked oxygen or compressed air. And some of the torches now on the market use natural or artificial fuel gas instead of acetylene. Still others use acetylene alone, sucking the necessary air through a side opening.

The tanked oxygen and acetylene process is probably

the most convenient method, on account of its reliable portability, a standard welder's oxygen tank being the commonest form in use.

The oxy-acetylene welder who has had no experience in lead joining nearly always tends to overheating, or in reality to burning the lead. But the novice easily acquires the idea and only requires practice in order to become skillful. He has lots of things to learn but each of them is simple by comparison with the welding of other metals. Constant practice will soon make his fingers obey his mind quickly and cunningly.

There are a large variety of lead burning torches on the market. And they are used for all kinds of soldering, brazing, and the joining of lead parts. The main uses in the garage and auto repair shop are for radiator and battery work, the latter probably being the most common form.

To illustrate this and to instruct the novice in the art of manipulating the lead burning torch, let us take as an example the attaching of a group of battery lead plates to the strap and binding post, taking into consideration the fact that the construction and design of batteries vary somewhat in different types.

In a job of this sort, the first essential is to be sure the parts to be joined are clean as in the welding of other metals, cleanliness is necessary in the lead process. The stem or strap of each plate in the group is cleaned until the bright metal is exposed. All of the air oxide is re-

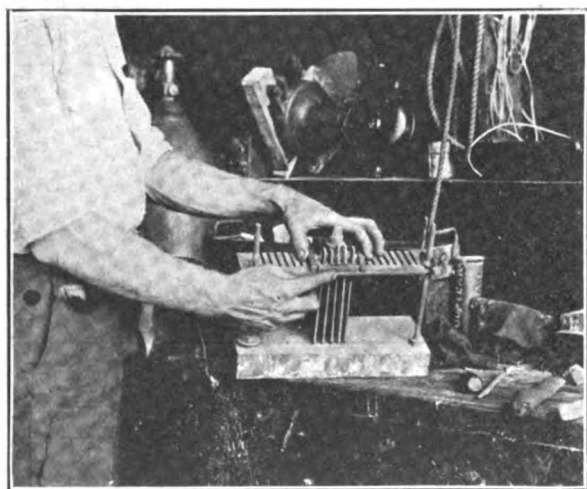


Fig. 3.—Showing the Arrangement of the Strips of Steel which Form the Mold for the Plate Strap Connectors.

moved from the surface of each strap. And the coating of oxidized lead is also removed from the post strap; not only on the top and bottom but along the edge and in between the fingers or grid.

Lead oxidizes more rapidly when it reaches the molten stage and the skin of oxide is heavier. But this peculiar metal is also subject to rapid oxidizing attacks of the atmosphere. A short time after it is scraped bright and clean the surface tarnishes and is coated with a thin skin of oxide. The oxidized coating, due to exposure to the air, is not very heavy and serves to protect the metal and prevent more or deeper oxidization. In fact it is said that the first attack of oxidizing is a protector to

the balance of the metal. And it is for this reason that lead does not appear to rust or corrode.

The necessity for cleanliness in the lead burning process is to prevent, or at least minimize, the amount of oxide that might become entangled in the melting lead. As in cast iron welding this oxide is detrimental if allowed to mix with the bond metal. If the bond does become impregnated with lead oxide the battery will have a defective circuit; in fact it will probably be short circuited. And after the new joint is cold it will look badly; the defects will show up plainly and cause the work to appear amateurish.

What Oxide Does

Of course the bond may be rendered defective by other causes. It may be oxidized or burned by the flame condition and manipulation in practically the same way as an iron or steel weld. When used in connection with oxygen and acetylene, the lead burning flame has the same adjustments as the welding torch; the excess acetylene flame; the excess oxygen flame; and the neutral flame. Either of which is regulated by adjusting the torch and tank valves. The flame presents in miniature a likeness of the big welding flame.

The excess oxygen flame tends to produce effects similar to the results of joining badly oxidized metals. In the words, joining the parts without cleaning. This flame oxidizes the lead, impregnating the whole bond, sometimes with flakes and sections of oxide. In a few words the oxidizing flame is too hot for the melting point of the lead. And in extremes it carries more oxygen than can be consumed by the flame combustion; the extra oxygen attacks the molten mass with avidity to cover it almost instantly with a coating of oxide.

Perhaps the worst effect of the other wrong stage of the lead burning flame is that the metal is not melted sufficiently fluid to mix well. The separate parts of the joint do not become hot enough to flow together into one body. Of this can be said (referring to an extremely carbonizing flame and to a pure acetylene flame) that either one is not hot enough for the melting point of lead. Then a poorly melted joint is likely to have misconnected portions or to be "shorted." The lead must be all melted into one homogeneous mass for best results.

The Neutral Flame

The neutral flame is the standard working flame of the lead burning torch the same as it is for the oxy-acetylene welding torch. In fact it is a welding flame but not large and powerful enough for ordinary welding purposes. Where oxygen and acetylene are used, the different stages of the lead flame are attained, in principle, the same as in the welder's torch. The acetylene is turned on and ignited; it burns with a long, quiet, yellow flame, smoking at the end if too much acetylene is supplied. Then, the oxygen is turned on until the two gases combine to form a shorter, sharper flame, which is the oxidizing flame and of which there are a number of degrees. To attain the neutral flame, then, the

oxygen and acetylene pressures are gradually cut down with the torch valves until the central cone of bluish white is short and clear. Which is the neutral working flame.

The length of this flame varies somewhat with the different styles of torch. But usually it is not much over half an inch long. It is then pale blue and has no ragged edges and no little flickering tongues of blue.

While the neutral flame is the correct one to use on lead burning it should not be thought to be perfectly safe for the making of good joints at all times since it may

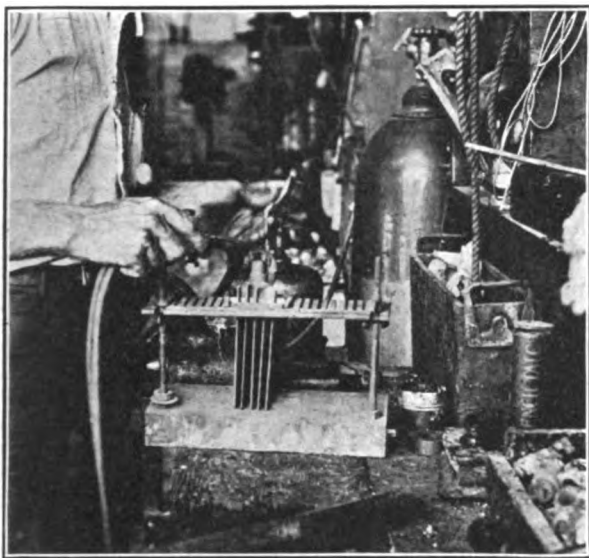


Fig. 4.—Filling the Mold with Lead To Connect the Plate Straps.

be manipulated wrongly and thus produce a poor job just as easily.

It is played upon the filler lead and the melting bath about the same as the welding torch would be on an iron weld. If it is bored into the bath or held too long in contact with the molten metal it is liable to burn the lead, with results as mentioned above. It is revolved or moved around according to the melting condition of the joint. It is revolved in tiny circles or moved in small arcs as the melting filler feeds into the joint.

The pressure employed on some kinds of torch is about five to ten pounds, on each tank, which is governed by reducing regulators. If more gas is used it blows out and is difficult to keep ignited. Some of the more modern torches have sizes of tips for which the gas pressure is varied according to the size flame desired.

Grouping the Plates

After the first step, or the cleaning of all parts to be joined, the next thing is to arrange the group of plates in the spacer, which is shown in an accompanying cut. This spacer is adjustable up and down so the operator can obtain the correct length of the plate straps. And the spacing slots are arranged so the plates are always the correct distance apart. Such a device may be purchased from the factory; or it may readily be made at home by an ingenious mechanic.

The grid or post bars do not always fit the plates accurately but must be pried apart to permit the post to

set level on the spacer. Some operators do not bother with trying to fit the post bars over the plate straps but simply saw them off close to the base.

At any rate after cleaning the post and straps, the next thing is to arrange the plates in the spacer, being careful to get the spacer grates the proper height above the edge of the group of plates. And incidentally the top of the spacer should be brushed free from rust and moisture before arranging the plates in readiness for the burning; this may prevent a bad burn, at least a poor joint. A moist spacer may be dried with the lead burning flame.

When the plates and post are in position, a mold is placed around the top ends of the plate straps as is indicated in one of the pictures illustrating the discussion. This mold usually consists of three pieces of smooth steel so placed as to form a frame or enclosure around the plate straps and post. The pieces of steel should be approximately a half inch square by three inches long and should be clean and absolutely dry when the lead is melted.

The Frame Mold

This frame or mold is for the purpose of preventing the molten lead from escaping. It is also to enable the operator to build up a joint more easily; also adding much to the appearance of the job when it is finished.

The torch is ignited and its flame properly regulated before applying it to the lead. A filler rod is then taken up and brought close to the job in connection with the neutral flame. Then the part of the filler is melted around the plate straps and along the edge of the post.

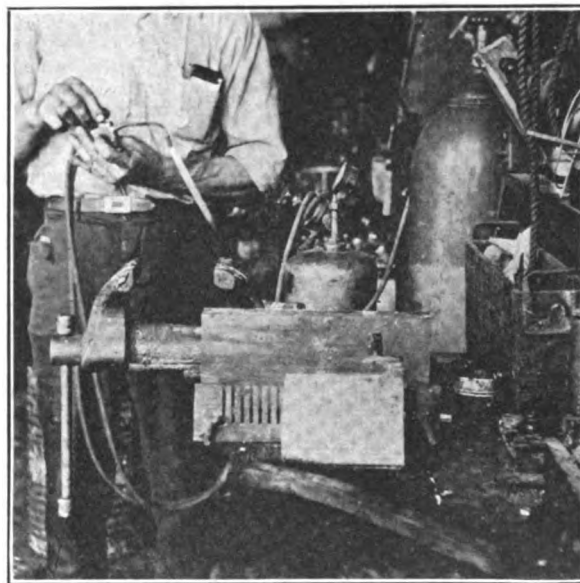


Fig. 5.—The Completed Job and the Lead Burning Torch Properly Regulated to the Excess Acetylene Flame.

The flame is not held close enough to the lead to flare or to be thrown back; it is held close enough to barely touch the metal.

The flame is worked back and forth and around, melting the ends of the plate straps and the fingers of the post down level into one mass. When this bath is fluid

(Continued on Page 58)

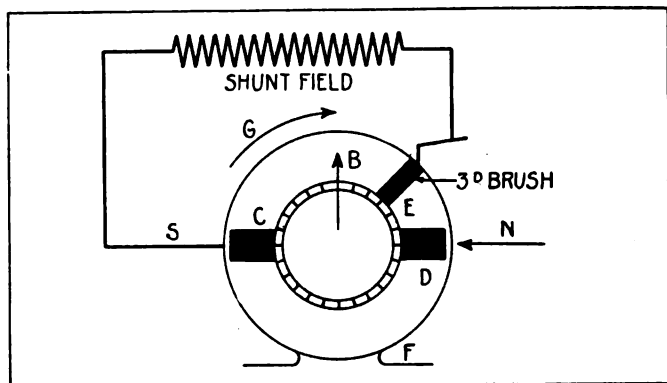


Ford Generator Is Inoperative

From Albert Thomson, Maine: I have a 1921 Ford car which has been giving absolute satisfaction up to last week when I noticed that the generator was not charging the battery, or at least the ammeter does not indicate any charging current. Thinking that perhaps the ammeter might be at fault I stopped the engine and turned on the lights; the ammeter indicated zero when the engine was stopped and jumped back to 10 amperes with the lights on. I reversed the connections on the ammeter just to see if it worked the other way and found that under these conditions it would indicate "charge" when any current was drawn through it, so that I know the hand is not stuck.

Can you tell me how to test the generator system to find the trouble?

Reply: The trouble is either in the generator, the cut-



Internal Diagram of an Ordinary 3rd. Brush Generator. B, Commutator; C, D, Main Brushes; E, 3rd. Brush; F, Frame; G, Direction of Rotation.

out or the wiring between the generator and the ammeter. The tests for trouble are simple.

The wiring is very simple and to simplify matters we might trace the circuit as far as the ammeter. When the generator first starts the voltage is low and therefore it is not possible for it to charge the battery, hence the cut-out. At first the circuit starts in the generator and goes to the cut-out, it passes through a winding on the magnets and then to the ground, thence back to the generator.

As soon as the voltage is high enough (about 7.2), the cut-out points close and the circuit is somewhat changed. Though a small part of the current still grounds through the cut-out the larger part flows from

the generator through a heavy winding on the cut-out to the ammeter and thence to the battery.

The cut-out is merely a safety valve which prevents the battery from discharging through the generator. If the wiring is correct, then the following test will prove it. With the engine stopped, press the cut-out points together for a second. The ammeter should show "discharge" and if it doesn't, then either the wiring or the cut-out windings or connections are at fault.

The next test is to find which unit is at fault, if the above test is negative. First test the generator. Make a testing outfit by taking a double-contact, six volt light bulb and socket and fitting it with two insulated wires with bare ends. Try it out by connecting it with the battery terminals. It should light up, of course, as soon as any current passes through it.

To test the generator operate the engine at a speed equal to 10 miles per hour car speed, no faster. Touch the test wires, one to the generator terminal, the other to the base of the machine. If the bulb does not light you can be sure that there is trouble in the generator. The generator troubles will be mentioned later.

Next test the wiring from the generator to the cut-out. (If the generator has been found to be O. K.) Touch one test wire to the cut-out generator connection, the other to the frame. The light should glow if the wiring is O. K.

The next test is one to find if the ammeter, cut-out wire is O. K. The engine may be stopped and one test wire touched to the terminal on the cut-out which connects with the ammeter, the other test wire to the frame. The light bulb should glow full strength, because you are now using battery current. If it doesn't glow, then there is trouble with the connections, or wire leading from the ammeter to the cut-out.

If O. K. to this point, test the cut-out by shorting the two cut-out terminals with the test wire. Connect one wire with the cut-out terminal leading to the generator, the other wire with the cut-out terminal leading to the ammeter. The bulb should glow to show current running from battery through generator. If all of these tests are favorable indications are that the cut-out is at fault and should be taken to an electrician for repairs. Before doing this be sure that it is properly grounded, for unless it is connecting with the ground it will not work properly.

To test generator, run the engine at about 10 miles

per hour and put test points upon the main brushes. If O. K. then trouble is between brushes and ground or external connection. If not O. K. test each brush by itself by putting one pole of test unit on third brush and other on each main brush in turn. (Bulb should glow

dimly at least in each case.) No glow in the bulb indicates trouble with the brush being tested. Examine brushes and see that connections etc. are O. K. If trouble is not found to this point send generator to service station for a more detailed investigation.

Special Ford Accessories

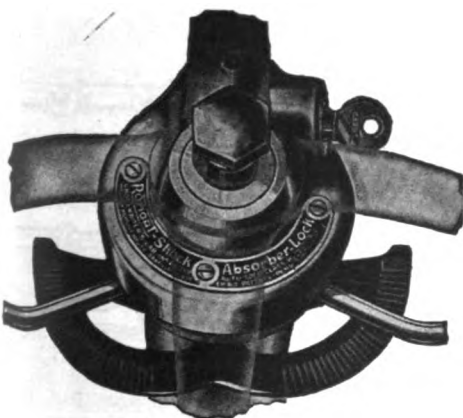
Drednaut Shock Absorbers Do Sell

H. S. Quick, Sales Manager for the Auto Specialties Manufacturing Company, St. Joseph, Mich., manufacturers of Drednaut Shock Absorbers reports unusual activities in the sale of Drednauts in the South. Mr. Quick states that J. W. Kelley, Manager of the Thos. E. Scott Sales Company, Atlanta distributors, has put his company on the map with a record sale of over 2800 sets of Drednaut shock Absorbers in five days. "This is a wonderful achievement," says Mr. Quick, "when you consider that Drednauts have been on the market in Atlanta for a comparatively short time." The biggest order Mr. Kelley got amounted to only 100 sets so you can see that he was selling in quite a number of places in order to make such a total. This order was sold to Irvin Gresham, an automobile dealer in Jacksonville, Florida.

Mr. Kelley states in connection with his trip, "Drednauts are fast proving to be the most popular shock absorber for Ford Cars on the market and wherever we go we find that they have already established a good reputation." Their good reputation means that they are living up to the merit built into them and this is what we are counting on for repeat orders. They certainly are a piece of merchandise that a dealer can handle and feel like his customers are getting an efficient and durable shock absorber.

\$100.00 for a Name

The Romort Manufacturing Company, of Oakfield, Wisconsin, have been for some time manufacturing a combined steering wheel lock and stabilizing device for Ford cars.



Up to this time they have called this the Romort Shock Absorber Lock, but on account of the popular understanding of the term "shock absorber" as referring to something in connection with spring suspension

this name has proved unsatisfactory and they now want a term that will be more clearly descriptive of the features of the device, and are offering a cash prize of \$100.00 for a suitable name.

The lock mechanism is a positive acting steering wheel lock so designed that accidental locking or unlocking is utterly impossible. This part of the device has passed the rigid inspection of the Underwriters Laboratories, and every lock is inspected and approved by them before delivery, thereby saving the car owner 15% of the premium on his theft insurance.

The shock absorber, or stabilizer mechanism differs from all other devices of that type in that it is located in the steering gear and lock housing instead of at the front axle and therefore tends to hold the wheel in a central position and absorbs all the jerks, vibrations and lost motion, or "back lash" generally found at the wheel.

An equally important feature is the spring construction which comprises a single spring so connected that in the event of breakage, though the manufacturers state positively that up to this time none has ever broken, there will be no tendency to run the car to right or left into the ditch or passing traffic, as has often been done in connection with the two-spring type of stabilizer.

Those who have used the Romort device are invariably enthusiastic over its operation and claim that not only is the steering wheel vibration entirely eliminated but that the car has the smoothness and steadiness of steering control usually found only in the most elaborately constructed and highest priced cars.

To insure absolute fairness in the selection of the name the final selection is left to representatives of this and other trade papers in which their announcement appears. The name of the winner will be published in these publications for October and payment made through the publication referred to by the dealer in submitting his suggestion for a name.

Here is an excellent opportunity for picking up One Hundred real honest Dollars.

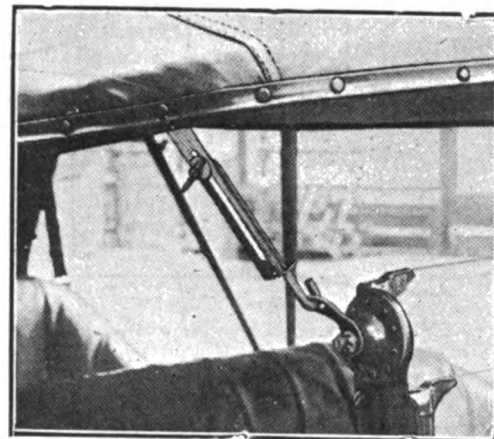
Direct personal familiarity with the qualities of the device will be of vast assistance to the competitor and dealers desiring to take a chance for this prize, may for the time being obtain a single lock direct through the distributors, The Zinke Company, 1321 So. Michigan Ave., Chicago, Illinois, in case their jobber does not carry them in stock.

Ford Hold-Fast Metal Adjustable Top Strap

We illustrate herewith a new specialty for the Ford car which is decidedly practical, useful and so low in price that it is within the reach of every Ford Car owner. This strap is designed to take the place of the leather or fabric strap which is

part of the original equipment of the Ford Car.

It is simple, yet rigid in construction; it is easily attached to the car without



the use of tools and adjustable so as to firmly secure the top to the wind shield. The Hold-Fast, it is claimed, will eliminate top rattling, and adds very much to the appearance of the car.

The construction of the strap is such that it is very durable, in fact, it is said that it will last the life of the car as it is made from the best of steel with a Park-erized finish to prevent rusting.

Good agents and distributors are wanted for this specialty and any of our readers who are interested should write to the National Auto Specialty Mfg. Co., 369 E. 162nd St., New York City, not forgetting to mention this magazine.

Band Ease

Band Ease has been on the market for the past year and a half, and is now rapidly become nationally known for being one of the most efficient means of taking the jump and chatter out of a Ford car.

The thing that causes the Ford car to jump and chatter in starting and stopping is that the transmission linings get hard and char. Immediately there is a jump and chatter which violently jerks the rear axle and cuts down the life of the car.

Band Ease takes but three minutes to apply to the transmission bands and is said to stop all chatter because it leaves the lining without any hardening or glazing.

Transmission bands are claimed to last three times as long when Band Ease is used, as it preserves the new bands and renews the old ones. Band Ease is made by the Laboratory Products Co., 227 Monroe Ave., Detroit, Mich., to whom all inquiries should be addressed.

A Ford Transmission Band Oiler

A careful study of the accompanying cut will clearly show the mechanism of the "Crystalites" oiler for Ford transmission bands.

The Ford owner realizes that a large proportion of the chatter and grab in the action of the transmission bands, particularly when the car is first used after a period of inaction, is due to poor lubrication.

Apply the service brake on a down grade and it will overheat in a short time: per-

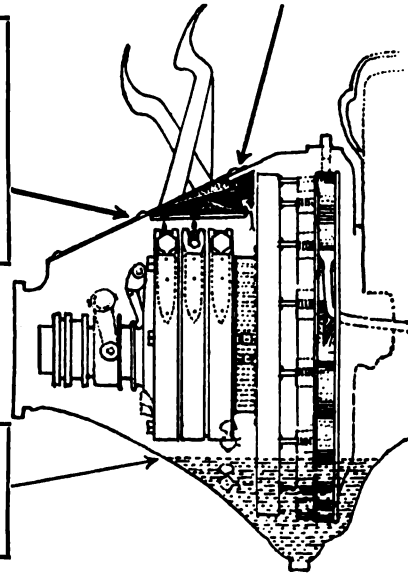
the top of the gear-set housing and is designed to catch the oil which is thrown off by the flywheel. The reservoir is provided with three holes from which a constant stream of oil falls to the three transmission bands while the engine is in operation.

We can heartily recommend this particular device as we feel that it will save money and worry for the Ford car owner.

It is manufactured by the Haines Mfg. Co. 90-104 South Ave., Rochester, N. Y. to whom all inquiries should be addressed.

Oil is thrown up by fly-wheel, caught by reservoir and flows in a steady stream directly where it is required. There is enough "pitch" in reservoir to insure flow of oil on steep grade.

CORRECT OIL LEVEL
You will note the bands are not in oil as generally supposed. You must depend on splash.



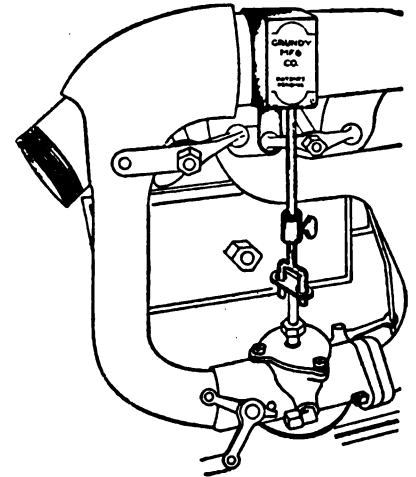
The A-Just for Fords

haps burn out entirely; and all because it gets no oil under such conditions. Lubricate the bands properly and their life will be increased and at the same time the chatter and grab is usually eliminated.

The "Crystalites" oiler would seem to solve the problem of band lubrication. It is an oil reservoir which is mounted at

We illustrate a new gasoline saving device which has many points of interest to the Ford car owner or mechanic. It is called the "A-Just." This attachment, as shown in the cut, will, it is claimed automatically make this adjustment of the gas

supply without any attention of the driver's part. Admits more gas when the motor is cool but automatically lessens it when the motor has warmed up, and less is required. It does this by turning the needle-valve, exactly as recommended in answer to the question No. 8 in the FORD MANUAL, admitting more gas when the motor is cold, less when it has warmed it. This control is absolutely unfailing. A coil of thermosta-



tic metal is so placed that when the motor warms up it expands, turning with it a rod, one end of which is attached to the control lever of the needle valve, cutting down the amount of gas supplying the carburetor. When the motor is cold contraction reverses the process opening the valve farther and admitting more gas.

Claim is made that the device soon pays for itself by saving gas, makes starting easy in cold weather and prevents too rich a mixture in warm weather. The A-Just is made by the Grundy Manufacturing Corporation, 2909 Meldrum Ave., Detroit, Mich.

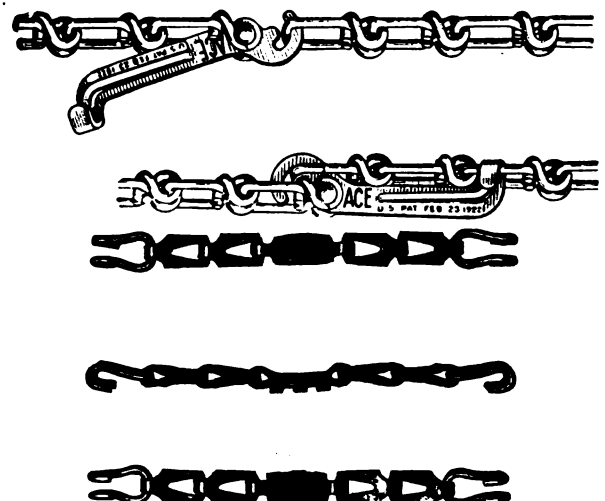
New and Useful Automobile Accessories

Ace Tire Chains

The Ace non-skid tire chains, illustrated below, present a number of new features. The cross chains consist of a center unit supplemented with flat links and hooks for various sized tires. The center unit is toothed on its face to present a non-skid surface, while its back is smooth and rounded to conform with the shape of the tire.

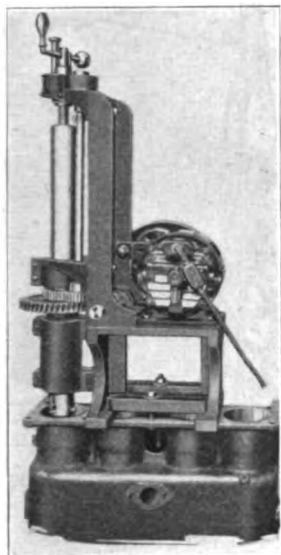
The links in the chains are made of solid, pressed, flat steel links, hardened and treated to insure both strength and long service. A patented, lever fastening device permits the side chains to be drawn tightly around the circumference of the wheel, without using any chain wrenches or tools of any kind.

These chains are manufactured by The Ace Chain Corp., with general offices at 23 So. William St., New York City.



The Wepplo Reboring Mill

We illustrate the Wepplo Reboring Mill. Some of the advantages of this machine are that it is small, simple self-contained and moderately priced, and it is guaranteed to do the work of reboring motor cylinders. Every Repairman who reads this magazine should send to the manufacturers for their interesting illustrated free circular fully describing this wonderful machine, which is a great money-maker for the repairshop.

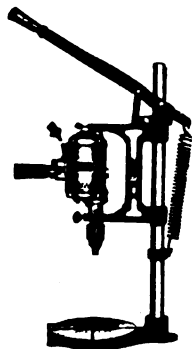


In writing, address The Wepplo Machine and Tool Co., 5340 Montrose Ave., Chicago, Ill. and mention this magazine.

Drilling Stand

A special bench drilling stand for use with its new "Garage Special" Portable Electric Drill has been placed on the market by the Cincinnati Electrical Tool Company, of Cincinnati, Ohio.

The stand makes it possible to convert the drill into a bench drill press in a few



seconds time. A cap and thumb screw locks or releases the drill.

The stand has a column height of 24 inches, the maximum height from base to drill chuck being eight inches. The diameter of the base is 10 inches. The entire stand weighs 45 pounds.

The drill bracket with the drill can be set at any point on the column and raised and lowered as desired. The weight of the drill and bracket is balanced by the spring in the rear of the column.

The drill is kept in vertical alignment by means of a key on the bracket and keyway in the column. Depth of holes is regulated by an adjustable stop in the column. The stand is equipped with a lever feed with quick return.

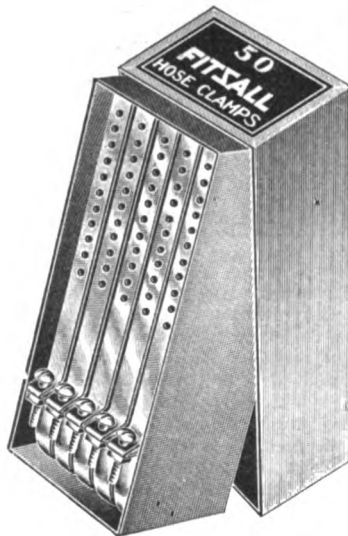
Correction

In the July issue we stated erroneously that the prices had been reduced on the well known "New Era" specialties. We regret that the error occurred, and we have been requested by the manufacturer to state that the New Era Spring & Specialty Company have not made any changes either in list prices or discounts on New Era "Better" Spring Bumpers, Tire Carriers or De Luxe Visors. The only change made during the present season has been an increase in the discount on replacement springs. Inquiries should be addressed to the main office and factory at Grand Rapids, Mich.

Fitzall Hose Clamps

Unfortunately water connections with the radiator and engine on modern cars have not been so standardized that they are all of the same size. Different sizes of hose connections call for different sized hose clamps and the dealer who wishes to stock all sizes must carry a lot of extra stock.

The Ideal Clamp Mfg. Co., Inc., of 198 Bradford St., Brooklyn, N. Y., is marketing a hose clamp which has the big advantage of fitting all sizes of hose connections. The clamp is called the "Fitzall" and it well deserves its name.



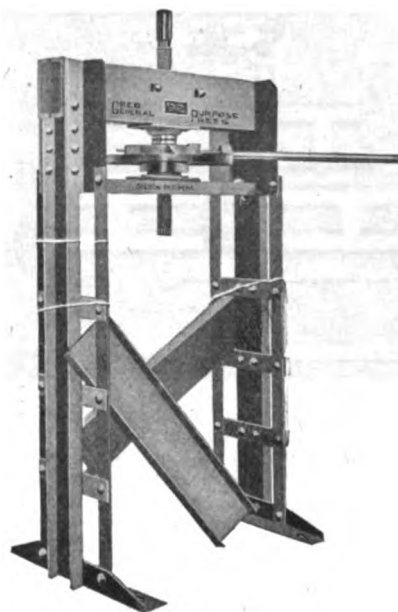
The Fitzall clamp is made from cold-rolled-electro-galvanized, flat wire stock and will fit all hose connections from one to three inches in diameter. The dealer will find it to his advantage to stock this clamp which comes packed in boxes, 50 to a box.

Pacific Coast Branch

The Tonneau Shield Co., Inc., 47-49 West 63d St., New York City wishes to announce to the public that they have opened a branch at 1828 Van Ness Ave., San Francisco, Cal. to care for the entire Pacific Coast. A stock of all shields will be carried there, as well as in Los Angeles. Mr. Charles Emanuel has charge of this branch.

Two Splendid Repair Shop Tools

We illustrate two excellent tools for any auto repair shop, both manufactured by the Greb Co., 197 State St., Boston, Mass. The Greb General Purpose Press, as shown in accompanying cut is very quick in action, has heavy steel channel construction for strength, reversible ratchet wheel with self-lubricating bearings, wheel located between two heavy malleable castings, small floor space required, suitable for work of



any length, channel cross bars instantly interchangeable, screw does not turn, press finished neatly in battleship grey. This wonderfully efficient press is reasonable in price and will make good money in any repair shop. We also illustrate the



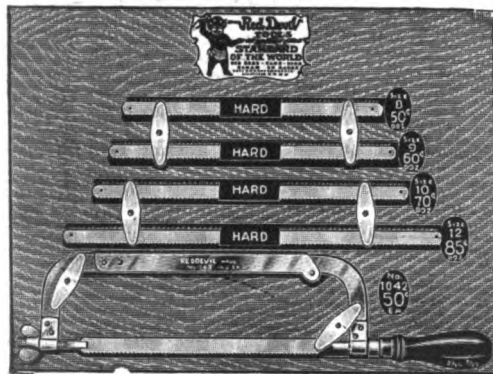
Greb Model G. Ball Race Puller, which can be locked into any ball-race up to 2 in. without any changes, making it an absolutely universal puller. Write for prices and further particulars direct to the manufacturers and mention this magazine.

In New Quarters

The Ault Mfg. Co. announces the opening of their new plant located at 8429 So. Chicago Ave., Chicago, Ill., and are now in a position to give their patrons immediate shipment on their accelerator. There have been some very good improvements made on their new model which makes it without a doubt one of the best accelerators for Ford cars on the market. For further information write to Ault Mfg. Co., 8429 So. Chicago Ave.

"Red Devil" Hack Saw Display Board

There are many advantages found in displaying a line of tools on an easel board. It is a great help to the dealer in showing a customer a particular tool or several similar tools without climbing up to the shelf or reaching under the counters. It enables the dealer to have a complete stock of tools without overstocking himself. The new "Red Devil" Easel Board shows an attractive display of four sizes of "Red Devil" Hack Saw Blades, 8, 9, 10 and 12



inch lengths, and adjustable hack saw frame to take blades of any of these sizes. Blades are made of high grade carbon steel. The frame is durably made of excellent quality steel and nickel plated. The tools are neatly and firmly held in place by mental clips. Price tags accompany the tools, and the resale prices are plainly indicated. Board is of oak, of three ply veneer. Size of board 12x16 inches. A metal easel back on the board makes it convenient to show the board in an upright position. The manufacturers are Smith & Hemenway Company, Inc., Irvington, N. J.

Consolidation of Fire Extinguisher Companies

Announcement has just been made of the consolidation of the Foamite Firefoam Company, with general offices at 151 Fifth Avenue, New York, and O. J. Childs Company, Inc., of Utica, N. Y., in a program uniting these important fire protection interests under a new and complete service organization. The O. J. Childs Corporation brings to the new organization a record of successful manufacturing and merchandising which extends back to 1896. "Childs" chemical and motor fire apparatus has the acquaintance and good will of fire officials throughout the country. For several years the Childs Corporation has functioned as the manufacturing division of the Firefoam Company, making the Firefoam portable devices at its Utica plant. The present consolidation with the Firefoam sales and engineering organization is expected to give the new and larger company the benefit of many manufacturing and distributing advantages. At a meeting of stockholders on July 21, it was decided that the Company will hereafter be known as "Foamite-Childs Corporation" and the following officers were elected: Mr. W. J. Childs, president of the Childs Corporation was elected president; Mr. F. M. Watters, vice-president; Mr. E. Janeway, secretary; and Mr. F. J. Maginniss, treasurer. Mr. James C. Patterson will continue as a Director in full charge of sales. It has been announced that there will be no change in the sales policies of the consolidating companies. As soon as possible after August 1st, the executive offices will be located at Utica, N. Y.

A New Catalog

A new 28-page catalog put out by the Metal Stamping Company of Long Island City, New York, covers this company's full line of Lyon resilient bumpers and parts, and is a perfect guide for those in the trade interested in the sale of these accessories. Forty-six illustrations of cars, before, during and after collision; agents' portable stand; accessory dealers' stand; distributors' display rack; envelop inserts and broadsides; an attractive window display, etc., help to make this a particularly attractive instructive booklet. Sent on request to those interested.

The Gier Steel Loading Blocks

A number of car manufacturers have adopted a new method of fastening down automobiles for shipment by rail from factory to dealer. By using Gier Steel Loading Blocks, instead of the wooden equipment formerly employed for this service, these manufacturers have reduced loading and unloading time and costs considerably, and at the same time have made their cars even more secure from possible damage while in transit. Gier Blocks are returned by the distributor or dealer and used over and over again indefinitely. In a test made in the Buick yards, a car of automobiles anchored with Gier Blocks was kicked against a



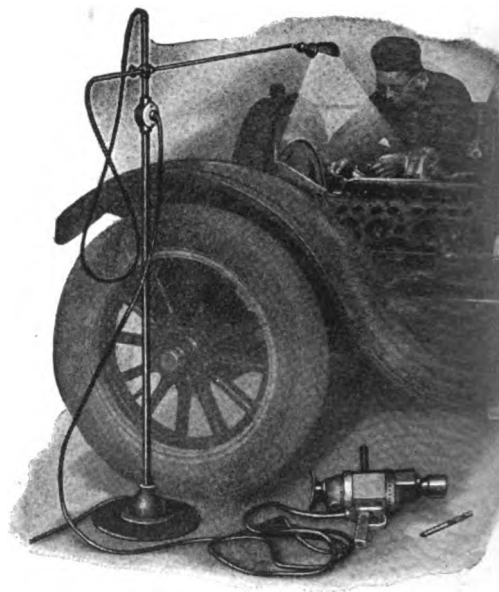
string of 13 empty box cars with all brakes set at a speed of 25 miles an hour. The couple draft timber and the whole end of one box car were broken by the terrific impact, but the Gier Blocks held the automobiles securely and without the slightest damage. The Gier Blocks are 10½ inches high and stamped from No. 10 gauge, blue annealed, pickled, oiled and limed stock. They weigh 10 pounds each and can be nested and returned to the factory by the car dealer in bundles of four or more by fourth class rating.

These Gier blocks average one and one-half trips a month at an average return cost of 40c per set of eight. Each is stamped with the automobile manufacturer's name to prevent loss in transit.

Tabulated figures show that the steel blocks earn their cost in five trips. Many letters from dealers express approval of the new method because of the time saved in unloading and the fact that the steel blocks prevent chafing of tires. Railroads have endorsed the method from a claim prevention standpoint. The Gier Blocks also do away with most of the damage to freight car floors, as an easily removable double head nail is used. These useful blocks are made by the Motor Wheel Corporation of Lansing, Mich.

The White Portable Lamp

Realizing the necessity for an improvement in lighting devices for Automobile Service Stations and Garages, the O. C. White Company, 15-21 Hermon St., Worcester, Mass., has brought out a line of Portable Lamps of special design and aptitude for this purpose. The idea is to give the workman the best possible light on his work, applied, without inconvenience, ex-



actly as he wants it. At the same time the general illumination, usually overdone in the attempt to provide a good working light, may be reduced to serve for general lighting only. This result is accomplished by an adjustable lamp arm, which, by means of special joints may be moved to the desired position without attention to set screws or other fastenings. An additional feature, exclusive with "White" Fixtures, is the incorporation as part of the Portable itself, of a "plug outlet" which serves as a most convenient point for the attachment of electrical tools or for another Portable Light. The Style SPT, illustrated, may be used for any work about or inside of a car and is ideal for lighting any work underneath the chassis simply by lowering the Lamp Arm and extending it under the running board. Another model, Style 1GP, is designed for wash stands, the 100 watt lamp used being much more efficient and economical than 800 watts on the ceiling or on hanging frames. For floor assemblies, the Style 2GPT gives a controllable flood light. All material and equipment used is of the best so as to withstand the exceptional hard usage received by most all repair shop apparatus. Applications are comprehensively shown in a descriptive folder that will be sent on request.

Removal

The Krasberg Piston Ring Co. have moved their factory, office and salesroom and are now in operation at their new location, 117 No. Jefferson St. near the Northwestern Station, where better facilities enable them to give to their friends and patrons up-to-date service on their line of V-Plex, Instantseat and Plain Stepcut Piston Rings. They also make piston rings to order on special contracts, as well as build Special Machinery, Tools, Dies, Jigs, etc.: to specification.

"Time Is Money"**LANE'S UNIQUE RATCHET WRENCHES****"SUPER UNIQUE SET"**

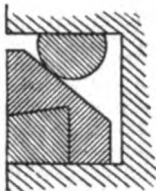
Save money by saving time on your repair work.

They do the work in half the time, do not mar the nuts or bolts, and their action is positive.

The sockets are broached, have no sharp edges to interfere and will not spread.

Over 500,000 in use—why not own a set? Dealers will find them a good sales proposition.

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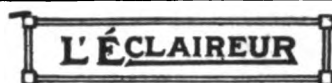
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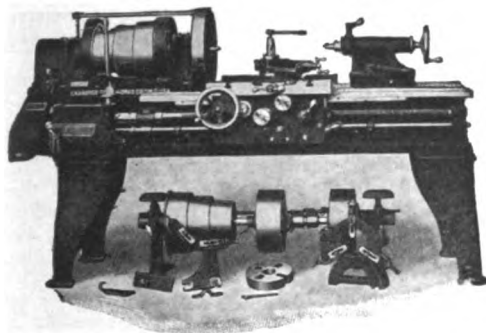
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EUREKA PREVENTO prevents rust from forming in the radiator or water circulating system. **EUREKA** not only prevents leaks, but it **STOPS THEM**. **EUREKA PREVENTO** when applied to outside surfaces, absolutely prevents rust.

\$1.00 will bring you a pint can, sufficient for one year. If not satisfied we will return your money.

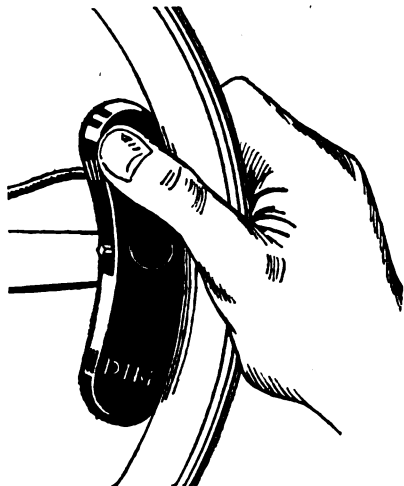
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AUTOMOBILE DEALER & REPAIRER
SUBSCRIPTION PRICE \$1.50 PER YEAR

Roxwitch

We illustrate a novel device which is manufactured and has just been put on the market by Patton-MacGuyer Co. of Providence, R. I. This new accessory which has the singular name of "Roxwitch" is a switching device, which puts headlight and



horn control "under your thumb." Roxwitch lies against the inside rim of the steering wheel, right convenient to your thumb. Operates by simple rocker motion. Press down front for bright lights. Rock back in opposite direction for dim lights. In neutral position it puts lights out. Easier to operate than gas or spark levers. The horn button in the center is operative in all positions. Roxwitch is a neat and an extremely attractive device. The case is brass, finished in dull black enamel, baked on. The horn button is red moulded material. All moving parts and contacts are enclosed. No dust nor rain can reach them. It comes equipped with cable and terminals, all ready to attach. Full instructions for attaching furnished with each switch.

Can be put on any make of car in a few minutes. No holes to drill, joints to solder nor special fittings required. A screw driver and a pair of pliers are the only tools needed.

Marko Radio Battery

Most of our readers are familiar with the Marko Storage battery, made by the Marko Storage Battery Co. of Brooklyn, N. Y. so that we need not enter into details as to its excellence. However, we want to mention a new product made by this concern, the Radio Battery.

Owing to the big demand for a battery which would function properly for radio work it has been necessary to produce a special battery and we feel safe in recommending this new product.

The Marko Radio battery is made in a number of styles and sizes from four to twelve volts. The plates are made to stand the steady drain required in radio work, the jars are of the best, highgrade, hard rubber and are provided with bridges to prevent shorting from deposits in the base. Each cell is tested separately and brought up to its capacity before being assembled in the box.

Two of the popular sizes for Radio work are furnished in "Rubellite" boxes. This type of case is moulded from one piece, including cell compartments and handles and are neat in appearance so that they can be used in the living room with the wireless set.

New Western Representative

Glen Harkrader, formerly sales manager of the No-Leak-O Piston Ring Co., has been appointed territorial representative for the Indiana Piston Ring Company of Hagerstown, Indiana, in the territory west of the Mississippi and in Minnesota, Wisconsin and Illinois. The Indiana Piston Ring Company manufactures the Perfect Circle Oil-Regulating Piston Ring. Mr. Harkrader will assume his new duties August 1st. He will be assisted by his brother Wallace Harkrader, formerly territorial representative of the No-Leak-O Piston Ring Co., in Illinois and Indiana. The Harkraders will maintain general sales offices in Chicago and San-Francisco. Both Glen and Wallace Harkrader are well known in the Piston Ring Industry.

Big Shipment of Buffers

The Valley Electric Company, Kingshighway and Connecticut Street, St. Louis, manufacturers of electric motors, buffers, motor-generator sets, and battery chargers, report the sale of seventeen buffers to the Post Office Department of the Federal Government. These buffers have been shipped to the tire service sections of the Post Office garages in Atlanta, Detroit, Kansas City, Los Angeles, Memphis, Omaha, Cincinnati, Newark, Buffalo, Denver, Dallas, Norfolk, Grand Rapids, Jacksonville and Chattanooga. The Valley Buffer is a standard ball-bearing Valley Motor of 2 h.p. with the rotor shaft extended sufficiently on each side to carry an emery stone and a compound brush. The buffer is mounted on a heavy cast iron base, carefully propor-



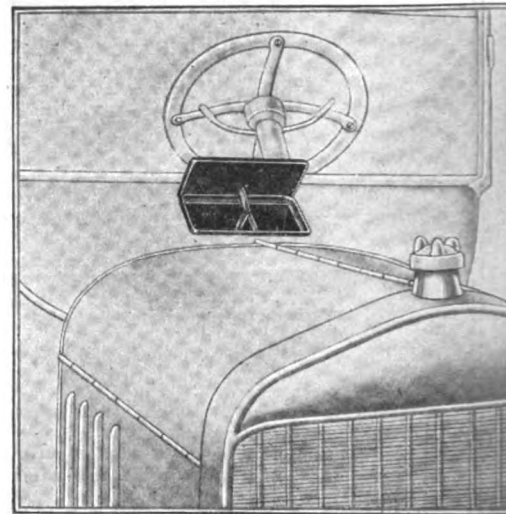
tioned to give rigidity to the whole machine. The end plates of the motor are enclosed, keeping the windings free from dust. The buffer is 46 inches high and occupies 4 square inches of floor space. The Valley Company is also manufacturer of a small, flexible shaft buffer for bench work.

Bastian-Blessing Takes Over St. Paul

An arrangement has been consummated between The Bastian Blessing Company, Chicago, manufacturers of Rego Welding and Cutting apparatus and the St. Paul Welding and Manufacturing Company, manufacturers of the Torit welding and cutting equipment by which The Bastian Blessing Company has taken over the entire output of the St. Paul Welding and Manufacturing Company's line of soldering equipment, trucks, preheaters and acetylene generators. The St. Paul Welding and Manufacturing Company on the other hand, will be the service distributors of Rego welding and cutting equipment and supplies and operate an up to date repair service station at St. Paul, Minnesota. They invite the trade to let them help in the solution of welding and cutting problems.

The O-K Ventilator

This new device is manufactured by R. D. Boyd Corporation, 2660 Washington Ave., St. Louis, Mo. The illustration will give the reader a clear idea of the mechanical features of the O-K Ventilator. Some of the advantages claimed are as follows:



simplicity, quick and easy adjustment, ease of installation, low cost, durability and neat appearance. Write to the manufacturers for prices and descriptive literature.

Aids to Driving Comfort

All parts on a chassis requiring lubrication are oiled from the driver's seat by means of the new O. K. Chassis Oiler which the Kellogg Manufacturing Company, Rochester, N. Y., widely known for its engine-driven tire pumps, is now putting on the market. The oiler is simple in construction, and is easily operated by a foot pedal or hand lever. Production on installations for several leading makes of cars has already been started and distribution is being made through Kellogg distributors.

The system consists of an oil tank and pump integrally mounted on the back side of the dash; that is, underneath the hood; operation is by means of either a foot pedal or a hand lever on the instrument board.

One of the outstanding features of this oiling system is that instead of providing check valves at the various oil pipes, the line is dammed up by very small holes, leading into the various bolts or other parts to be oiled. In this way the amount of oil to be supplied for the various points is regulated. Furthermore, by having small holes at the sundry points, pressure exerted on the pump immediately builds up pressure in the pipe line sufficient to force oil to the various bearings.

Another advantage is that the oil cannot run out of the tank. It can only be delivered when operating the pump. The main pipes, however, are filled at all times with oil. Thus, with a car operating along rough roads, the capillary attraction from the working bearings at various points will draw a small portion of this oil from the main feed pipe, lubricating the bearings at the time when they require it.

Installations are now available for twelve makes of cars, with others being rapidly added to the original list. The twelve makes are: Dodge, Essex, Hudson, Hupmobile, Jordan, Maxwell, Oldsmobile, Paige, Packard, Rickenbacker, Studebaker and Velie.

Fenders		Pedal Pads and Extensions		The Universal Motor Service Lathe	
Superior Lamp Mfg. Co.	55	Auto Pedal Pad Co.	10	14-24" Sliding Cap Lathe	
Ford Locks		Piston, Rings			
Packard Engineering Co.	16	Auto-Diesel Piston Ring Co., The,	8	Just the thing for Garages and Motor Repair Shops	
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Zip Mfg. Co.	16	Pressure Proof Piston Ring Co.	55	The Universal is strong durable and accurate. It will cut right and left-hand threads, and millimeter threads. It is capable of perfect work on all kinds of milling jobs, taper work and cylinder re-boring.	
Garage and Shop Equipment		Kendell Engineering Co.	14	No motor repair shop can afford to be without this high-grade, reasonable priced machine. Drop us a line and ask for new bulletin and latest prices.—It will start you on the road to bigger profits.	
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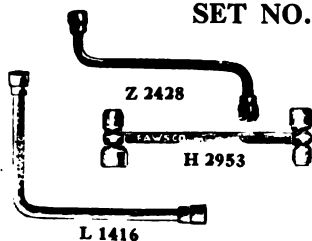
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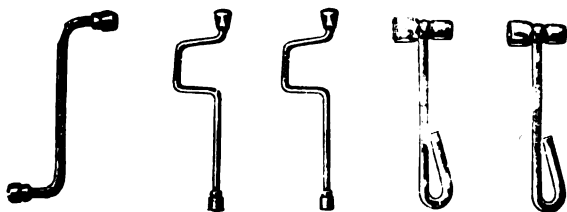
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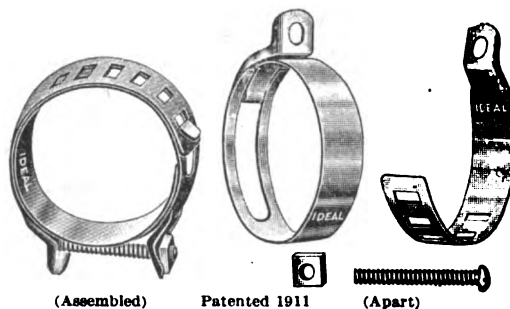


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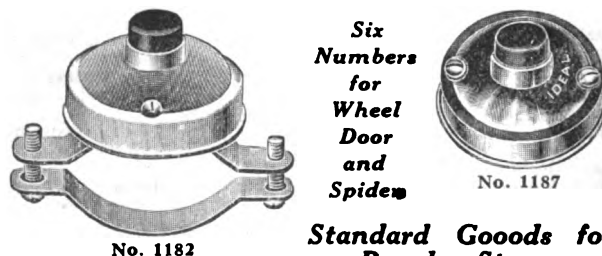
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THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 16-22 Hudson Street - New York City

Entered as Second Class matter January 15, 1921, at the Post Office at Cooperstown, N. Y., under Act of March 3, 1897

Vol. 34, No. 1.

SEPTEMBER, 1922

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This Counter Display Will "Ask 'Em to Buy"

Write for it now. But better still—ask for two—one for your counter and one for your window. You can't run around and show customers everything that you sell—but this display will tell every one of your customers that you sell Shaler 5 Minute Vulcanizers, and Shaler Patch-&-Heat Units. It's the best "Sales Stimulator" that you ever saw—a "Magnet" that will draw new customers into your store if you will merely put it in your window. It brings 'em in to buy.

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THIS "no water" cleanser can now be had in a collapsible container holding enough for three dozen washes. Every tube is banded with a colorful jacket and seeing it packed in a snappy display case on your counter, a customer will need mighty little persuasion to tuck a tube in his pocket and take it along. Try him and see.

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Automobile Dealer and Repairer

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SEPTEMBER, 1922

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Prologue

*Oh Muse of Motordom, who guides the thoughts of us poor men,
Inspire me With thy will sublime and guide my stumbling pen;
Help me to write in words of fire, high up upon the skies,
A message to my fellow men, that it may catch their eyes.
I pause to get thy quickening touch, my hands I give to thee,
A vision comes, I haste to write, and this is what I see,—*

The Vision

*He drove upon the highroad wide, the skies above were blue,
A happy wife sat by his side, the engine sounded true.
His car was running like a hare, without a squeak or groan,
Steep hills were mounted just like air, without a knock or moan.
And in his heart sweet peace did dwell, dull care was brushed aside,
When, all at once, I grieve to tell, the darned old engine died.*

*(Oh Fate, dost think that this is fair, this kind man to pursue?
Dost Justice sleep, is all despair, what will the poor man do?)*

*I watch and hold my breath the while, beneath the seat he looks,
He gives a tug and with a smile, brings forth a pile of books.
I rub my eyes, what are they pray, and will they help this soul?
Can mere black type save this man's day and get his car to roll?
My vision clears, I see from far, the words are from my pen,
They tell him how to fix his car and ride like other men.*

Epilogue

*The picture fades and all grows dark, but yet my lesson's plain,
My duty's clear, my task laid out, to help my fellow men.
And so I take my pen in hand, this article indite,
To Mororists whose cars quit cold, who are discouraged quite.
I'll tell them how to tame the things, and find the trouble too.
So go ahead, read on my friend, this article's for you.*

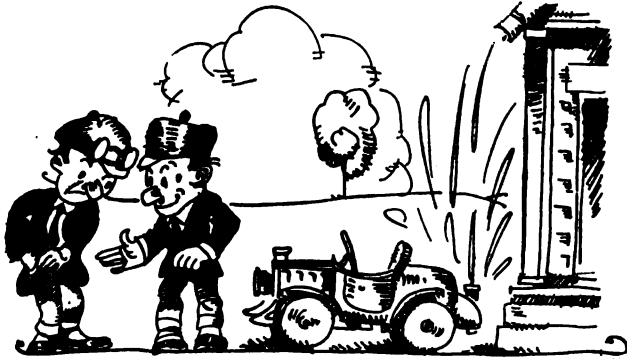


THE **T**HERE is something definite and positive about the sudden quitting of an automobile engine which usually gives one a sense of vacancy. You are driving along in your car, chatting breezily with the family, smiling at the birds, passing mere pedestrians with a flourish and clatter, when, all at once you notice that something is missing beneath the hood.

The engine, which heretofore has behaved like a tame donkey, suddenly acquires the whim of a mule and sits down on its haunches, figuratively speaking. Gone is your airy persiflage, your smile freezes on your lips, despair grips you and you feel that all is lost.

Instead of an almost living machine beneath you, you suddenly realize that it is nothing but a bunch of wood, wind, iron, and wires. To paraphrase Mr. Kipling, you feel that instead of a car so fair you have nothing but a

frame, some springs and a bunch of hair. Instead of being the envy of pedestrians you become the butt of their ridicule. The sun of your good nature sets and your previously, gentlemanly English becomes a blur of savage wickedness.



"The Country Repair Man Doesn't Do Much, Except to Your Pocket Book"

And then you grab a wrench or hammer in one hand, a pair of pliers in the other and hazard a flank attack upon the sleeping beast beneath the hood. A splutter of blue flame, a curl of smoke and a sneeze that would do credit to an elephant are all that can be evoked from the machine.

After you have exhausted your ingenuity, used up all of your profanity and are at a loss what to do next, you sit down on the running board and look over the instruction book. You look over the first 25 pages of fine type which tell you all about pumping up tires, filling the gas tank and changing gears.

You pass to the next 15 pages and find that the folding of the top, cleaning the windshield, keeping the varnish in its pristine grandeur, are the topics treated. Hopefully you pass to the last few pages only to find that a camping trip in your car is highly advisable and that should you contemplate such a trip, be sure to take a powder puff, an extra hair net and your fish pole. Not a darned thing about why your engine has just quit work.

If You Happen to be Lucky

If you are lucky your wrench happens to slip or you hit your elbow against the thingamagig and the old engine is tamed at once. But if your luck does not hold out, you monkey around the thing for a couple of hours, getting grease in your hair and scaring your wife and children almost to the fainting point, then you send or go for help.

The repair man arrives, lifts the hood, sticks a gnarled and dirty finger into the works and tickles the engine into action. He doesn't do much, except to your pocket book, but what he does is right to the point. He sniffs in superior disdain and goes back home, but your day is spoiled, the sun shines through fog and everything seems blue.

Had you only known what to have done you would have been spared the humiliation of that repair man's look, the amused spectators would not have obtained so much entertainment and little time would have been lost.

The average car owner is helpless when the engine

quits work, with apparently no reason. Things happen which cannot be foreseen and the makers of the car could never compile an instruction book which would cover all possible troubles.

A systematic chasing of trouble is always best. The man who hops around like a fly on a hot stove cover, tinkering with everything and disarranging anything which happens to be convenient, does more harm than good.

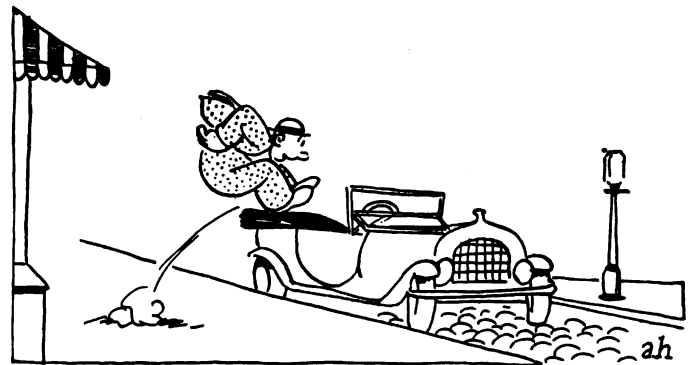
Usually Just One Reason

When an engine stops there is a reason. This may seem like a useless statement to make but it isn't quite as foolish as it seems; notice that I said *a* reason, a *single*, *basic* reason; seldom more than one reason.

When your engine stops, find *the* reason, don't try to make a reason. There are a number of simple tests which every man can make and by which he can definitely locate the trouble.

To illustrate my point. Should you be taken with a high fever, the family doctor would not immediately submerge you in a bath of ice water. If he did this little thing, doubtless he would soon lose a good customer and the undertaker would furnish the necessities for your last ride. No, the doctor immediately tries to locate the cause for the fever, he cannot afford to try experiments.

As the doctor of a sick engine you cannot afford to derange parts which may be functioning properly. And now I will outline the procedure for you to follow. Observe my directions to the letter and follow them in the order I have given. I'm assuming that your engine has



"The Man Who Hops Around, Seldom Gets Far, When He Wishes to Find Trouble"

been running all right and that there is nothing radically wrong like the breakage of a connecting rod or the loss of the flywheel.

Naturally the first thing to be done is to satisfy yourself that there is fuel. You may find the tank half full of gasoline, but what you really want to know is, "Is there gas in the carburetor?" Most carburetors are provided with drain cocks and it is a matter of seconds only to draw off about half a pint of gasoline through this petcock. But suppose that there is no drain cock?

If no means is provided for draining the carburetor, you have a choice of two things. You can disconnect the gasoline pipe from the carburetor and see if the fuel is running through it, or you can pour about a teaspoon-



"The Sun of Your Good Nature Has Set, Your Hair Is Rumpled, Grease Is An Inch Thick on Your Nose and Your Wife Starts To Warn You Against the Type of Language You Are Beginning To Use."

ful of raw fuel right into the air intake and try the engine.

But you may find that the fuel will flow from the pipe and none actually gets into the carburetor. With no drain on the bottom of the carburetor you will be as much in the dark as ever. Wet a small piece of cloth with gasoline, tie it into the carburetor air intake so that it won't work into the engine and then try to start the engine. If the engine gives a few languid puffs and quits, then runs again when the cloth is wet with fuel, you can well feel that something is wrong with the carburetor. Don't make any adjustments on the carburetor until you have tried this test.

If the engine happens to be fitted with priming cups it is a good plan to prime the engine once and see if it will operate, one or two explosions to each cylinder. Don't overdo the matter and keep priming or the raw gasoline will cut the lubricant and, perhaps, cause great damage.

If the engine runs for a few seconds when you prime it, but will not run otherwise, then you can feel sure that there is something wrong between the manifold and the fuel tank. This does not mean that you are to pull the carburetor off, change all the adjustments, bend the float and so disarrange things that the engine could not run. Use your brains and go slowly.

There are really but two reasons possible for sudden carburetor failure. Either no gasoline gets into the float chamber, or the needle valve is plugged up. Carburetors are so various in types that it would be impossible for me to tell you how to make the proper adjustments on all of them. But if you follow my advice

you won't get into trouble.

Before tinkering with the carburetor look it over very carefully. It is sometimes an innocent looking affair, but more often it bristles with nuts, wires, pipes and what nots. The more things you disarrange, the more danger there is that you will eventually call upon a garageman for help. Hence my advice to get acquainted with it.

It is fairly safe for you to examine the inlet or float valve. Chase out the supply pipe from the bottom of the vacuum chamber or from the tank and see where it connects with the carburetor. At this point you will probably find a little cover, over the valve, which you can remove and then the valve will be evident. In some types of carburetors the whole top of the float chamber lifts off. With a little common sense and examination you can determine whether or not the fuel is getting to the float chamber.

The next thing to do, after you are sure that the fuel is getting to the float chamber, is to clean the needle valve. It is fairly safe to say that every make of carburetor has a different location for the needle valve. Some have fixed jets, others have adjustable jets. Look the carburetor over carefully and locate the mixing chamber where the valve opens.

If you find that there is an adjustment, then unscrew the needle and push a thin wire through the jet. Before you disturb the original adjustment, however, you should make sure that you can return the needle to its proper position. Turn the needle to the right, clockwise, noting how many turns and fractions of a turn are required to close it. Then when you put it back you can close it fully and back it off the proper number of turns.

Up to this point you have been working on the gas supply system. If, in your original test, you found that the engine would not give any results even when it was primed,

you can feel fairly sure that the trouble is in



When Your Engine Is Sick It Needs the Attention of a Competent Auto-Physician

"Before Your Tinkering Has Reduced the Car To a Bunch of Elements, Use Your Brains. An Ounce of the Grey Matter Is Often Worth a Pound of Mis-Used Tools



the ignition system. If this is the case, then proceed along the following lines.

Turn on the ignition, (spark fully retarded), and note what the ammeter says. If the ammeter shows a discharge of around 15 amperes when the ignition is on, then you know that there is current running through the ignition coil. If it shows an extremely high discharge, 30 amperes or over, it is probable that the ignition system is "shorted" between the battery and the coil.

But it is possible that the ammeter will not show any discharge. The case when the contact points in the breaker box are separated. In such a case you should have someone turn the engine over very slowly while you watch the ammeter. There will always be two points in every revolution when the contact points are together. As soon as the ammeter shows a discharge, quit cranking the engine and continue with the tests. If the ammeter cannot be made to show a discharge, then there is a break in the wiring between the battery and the coil or the switch does not complete the circuit.

The next test to apply, after making sure that the contact points are together and current is running through them. Remove the distributor cover and the center wire which leads to that unit. Hold this center wire about $\frac{1}{4}$ of an inch away from the cylinder head and snap the contact points together and apart with your fingers.

A spark should occur, between the wire and the cyl-

inder head, each time the points are separated. If such a spark occurs you can go forward to the next test, but if no spark shows, then your trouble is in the coil, the condenser or the wiring leading to the coil, the distributor or the ignition head.

If the spark is thin and anaemic, it is a sign of a punctured condenser or poor condenser connections. If there is a hot, snappy spark at the breaker points, the condenser or its connections are at fault and you will need a new one.

Wipe the inside of the distributor head and clean off the distributor brush. See that the contact points are clean and make a flat contact with each other, then replace the distributor head.

Remove all of the spark plugs and open the priming cups so as to relieve the compression. Put the plugs on the top of the engine and connect the wires with them, then spin the engine. A spark should occur at each plug, once for every two revolutions. By watching each plug in turn you can easily pick out the ones which are not working properly.

And this completes the ignition tests. If you have followed my outline carefully you will have found the trouble and your car will be moving again. But above all things, be sure to form a mental picture of every part before you disturb it so that you can put it back just the way you found it.



AFTER VALVES ARE GROUND

FEW people realize the importance of proper adjustment of the valves after they are newly ground into place. Just as few realize the importance of protecting the valve faces and seats for the first few hundred miles of running. Once let the valve stick open slightly, just enough to accumulate a few grains of carbon and the work of the grinding operation has been done in vain.

The act of grinding the valves naturally lessens the clearance between the valve stem and tappet. This is no secret, merely a fact. But usually a new valve clearance must be given the machine on this account, and it is about this that we speak.

The average valve stem and tappet clearance is from .003 to .004 of an inch, hardly more than the thickness of this piece of paper, so thin that the slightest error may result in the spoiling of the valve grinding operation.

Before you can be certain that the valves are seating properly, the engine must be operated for some time, about 100 miles, and then you can safely gamble that all of the valves are worked down into their seats as far as they can. To accomplish this result set the valve clearance, at first, to at least .002 of an inch more than that which is proper for the engine. Usually .005 is a good figure to use for this clearance.

With this extra clearance the engine will run noisy. The valves will all knock or click and the engine will not give its full amount of power. But these small inconveniences are well worth standing for a time. The valves will surely seat themselves and any excessive carbon or emery dust will have been blown from the faces.

At the end of about 100 miles the valves may be adjusted to the proper clearance and the engine will do its best work.

Your Newspaper Advertising

The Easiest Way To Keep Your Shop
and Work in the Minds of the Public

By A. B. Cassett



TWO things make advertising almost a synonym for "optimism." One is that the advertiser who would be successful must be an optimist. The other is that when an advertiser loses his optimism he generally cancels his advertising.

"Business is rotten" exclaims the manufacturer, and forthwith orders all his advertising stopped, little realizing that his own action is one of the causes that makes business rotten. Cancelling advertising is so easy that it is nearly always the first step toward retrenchment. The matter is seldom decided on its merits. It is impulse. Advertising must be an expense, the advertiser reasons. Therefore to cut it off effects a saving. The stoppage of advertising during times of stress and change has two bad effects upon the business involved. It turns off immediately a method of securing

men who are, perhaps, also on the verge of doing the same thing. Now as a matter of fact if you say a thing can't be done, you make it so.



CUT OUT

THE
ARGUMENT

AS TO HOW IT HAPPENED

HOW TO FIX IT—

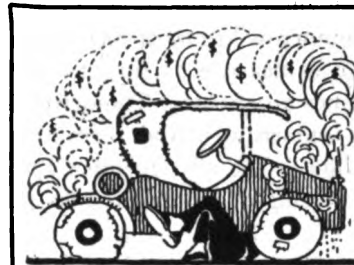
IS THE MAIN THING NOW

USE THE TELEPHONE

LET US KNOW WHERE YOUR
CAR IS—WE'LL GET IT.

JACK'S GARAGE

TELEPHONE 107-J
FAIRHAVEN ————— N. J.



**YOU'LL
RUIN
A \$60 Suit
Of Clothes**

Down Under That Car

We can probably
make that repair
for \$5.00 and save
you \$55.00.

BALDWIN'S GARAGE

Telephone 67-B
Stoneham - - Wis.

new business and holding old business. In addition to that, it advertises the pessimistic views of the advertiser, and therefore, spreads his own lack of faith in himself, his goods, his country, and the future to other business

Our greatest enemy is fear, and fear exists only within ourselves. If you admit that business is rotten and that there is no future for you—then there can certainly be none. You have said it can not be, and in the saying you have made it so.

If you establish a certain line beyond which you say you can not travel, then you have most certainly established a line beyond which you can never go.

You have established your own limitations, you have admitted your own weakness, or rather you have set up the weakness within you as superior to strength and courage. Nothing is impossible—nothing is beyond the reach of the individual, you have only to look about you in order to find the evidence of this truth; it is demonstrated on every hand by the thousand things possible today that were impossible yesterday.

The man who waits for the future usually finds that the future hasn't waited for him.

Whether you experience hard times or not depends more upon what you do to get business than upon any general condition of affairs throughout the country. I don't have to advertise says Mr. Know-it-all—the people know where I am.

The things you leave for the public to find out for itself about your garage may be a long time getting the light of day on them.

The only way to get business all the while is to advertise all the while. Advertising once in a while will not even get once in a while business. If it pays you to keep a six inch double column ad in your town paper all summer it will surely pay you to keep a two inch single column ad in that same paper all winter.

Don't say "I'll take this matter up with my partner tomorrow." The word "tomorrow" to most men means the remote future. It is not a measure of time to them; it is an expression that frames an excuse. Tomorrow is the hereafter of all hope—tomorrow is the refrain in the chorus of the failure-fellow. We all remember the little girl who awakened in the night and wanted to see tomorrow.

Tomorrow is a season most men depend on, but today is the hour they live on. Tomorrow is a by-product of the present. Tomorrow is the day when you propose to overhaul that junk pile and pick good money out of it—

have set aside for making needed repairs to your garage—fit your own self for better work—change your course.

But some day you will awaken suddenly, Mr. Man, to this situation; it will be your last chance and you will,

**WHEN
THAT
RAINY
SPELL
COMES**



Bring your Car
to us for

OVERHAULING

EAGLE GARAGE

205 Longwing Ave.

Belleville - R. I.

PLEASED?

Why, of course
he's pleased—

We repaired his
car in just 25 minutes—
and sent him on his way
rejoicing.



See Us First and Save Time

The Franklin Garage

700 Smoot Ave.

Rockport - - N. Y.

from force of habit, inquire, "Is this tomorrow?" Fate will reply, "No, you big whimpering idiot, this is today!" And then the door of opportunity will slam shut in your face.

HANDY TOOL HOLDER

By R. L. Prindle

EVERY one who drives an automobile has wished a thousand times if he has once, when he desires some tool, perhaps only for a moment, which is located in the most unhandy place that he had kept the tools in a more accessible place.

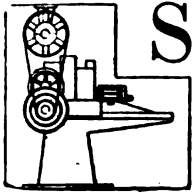
If the car has a storage place or deck that has a door opening to it, you can easily fit across the inside of this door a small length of one-inch board, and on this nail a leather strap with loops in it to fit the tools used the most. Then, when such tools are wanted simply open the door and any tool is found instantly.

As a second choice, use a narrow strip of wood so the tools cannot touch it, or it should be padded. A strip of old carpet will be excellent for this purpose, otherwise constant vibration of the car in motion will cause the tools to rattle.

tomorrow is the day you have settled upon to start giving honest-to-goodness service and to quit "stinging" people a big price for ordinary repairs—tomorrow is the day you

The Casehardening of Steel

A Comparison of the Time Required For Hardening with Different Packing



SOLID packing materials have more or less of a disadvantage anyway, whether they are simple or complex. By "solid" packing materials is meant those made up of solid ingredients like powdered charcoal, and the like. Potassium cyanide is viewed as a liquid carburizing material, because it is usually liquid when it produces its results.

The disadvantage of solid packing materials referred to consists in the difficulty of knowing in advance precisely what the final results will be. The reader need not be troubled by this, further than to make sure that he uses the very best—those recommended by people who have investigated them and *know* what they are recommending and just how they will probably act.

A Comparison

It will be of value to know how different packing materials compare with one another. An investigator, Mr. Shaw Scott has given attention to this matter. His experiments gave some interesting results that are shown in the form of curves. Let the reader not be alarmed. I am going to explain the curves. If the reader is not already familiar with the method which uses a curve to display results, he may perhaps do well to begin to learn right now how it is done.

The experimenter is assumed to have used ordinary soft steel for the experiments and to have employed a temperature of 1650° F. (= *orange*). The packing materials were three in number:

1. No. 4 mixture of pulverized wood charcoal and barium carbonate.
2. Carbonized leather.
3. Pulverized wood charcoal.

Quite a number of experiments were made, some with one kind of packing material, some with another kind. Some experiments were for short periods and some were for long ones.

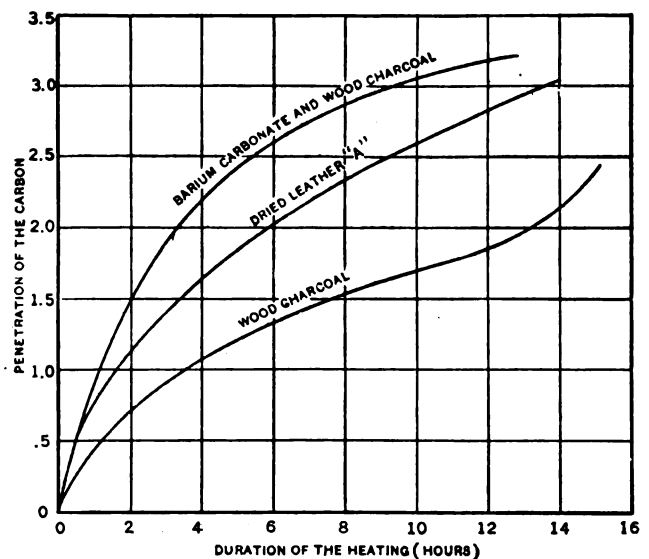
Now look at the diagram. There is an uppermost line or curve on which is marked "Barium Carbonate and Wood Charcoal." This refers, in effect, to recipe No. 4. If the reader will trace this curve from the lower left-hand corner of the diagram, he will come to a place when it passes through the point where a horizontal line intersects a vertical line.

If one looks at the foot of the vertical line, he will see the figure "2." This means 2 hours. In fact, all the figures along the bottom of the diagram refer to hours, as is in fact explained right on the diagram. Now let us return to the point of intersection already mentioned. By tracing the horizontal line to the left, one will come

to the figures "1.5." This refers to the depth of the case-hardening effect. The "1.5" means 1.5 millimeters. If the reader does not wish to bother himself with millimeters and prefers inches, let him look along the horizontal line to the right. At the end, he will find the number ".06." This means .06 inch, or just about 1/16 inch.

The curved line represents a series of experiments. In fact, every point in it is assumed to represent *one* experiment. If a horizontal line is drawn through the point we find how thick the shell was made by the case-hardening process. In the particular instance supposed, we found .06 inch. This is the thickness of the shell. The .06 is at one end of the horizontal line. If a vertical line is drawn through the point, we can determine the number of hours involved. In the present case, we found 2 hours to be the time. Combining the two pieces of information, we get the information that .06 inch thickness of shell is produced in 2 hours. Or, that in 2 hours the thickness of shell will be .06 inch.

By drawing horizontal and vertical lines through any point we please on the curve, we will be able to determine the time and the thickness. If the lines when drawn have



no numbers at the ends, that does not matter. We can judge from the other numbers. The numbers that are already on the diagram help us to judge.

We can tell from the diagram how long it will take to get a certain given thickness of shell. Or, we can tell how thick the shell will be, if the time in such and such. For example, suppose we want a shell .08 inch thick. We look along the right hand side of the diagram and find ".08." We then trace the corresponding horizontal line and find where it cuts the uppermost curve. We then draw, actually or in imagination, a vertical line through this intersection. It will cut the bottom line of the dia-

gram between "2" and "4." This means that the time required will be between 2 and 4 hours. We can get closer to the time than that.

The point where the vertical line cuts the bottom line is nearer the "4" than the "2." In fact, it cuts at just about $\frac{3}{5}$ of the distance between "2" and "4." The whole interval from "2" to "4" is two hours. Three-fifths of this is $\frac{3}{5}$ of 120 minutes. This amounts to 72 minutes, or 1 hour 12 minutes. Consequently, the exact time when the shell will be .08 inch thick will be 3 hours 12 minutes.

Time Regulates Thickness

Again, suppose we are given the time, say, 8 hours, and wish to know what thickness the shell will have at that time. What we do is to look along the bottom horizontal line until we come to "8," which means 8 hours. We follow the vertical line up until it cuts the curve. Then we imagine a horizontal line through this point. It will indicate something between .10 and .12 inch. We may judge it to be pretty close to .11½. This would mean that, in 8 hours we would get .11½ inch of shell.

If the inexperienced reader will practice using the diagram in this way, he may expect to get expert at it after awhile. Instead of making things hard, it makes them easy.

Now, on the diagram are two more curves—one for "Dried Leather" and one for "Wood Charcoal." We can use the diagram for these just as well as we did for the topmost curve.

Except down near the left hand corner, the curves are all separate, the one from the other. None crosses another. In fact, the way the curves lie shows very clearly that (except near the corner mentioned) the result with the mixture of barium carbonate and wood charcoal is always better than with the dried leather. And the dried leather is always better than the wood charcoal. In short, the mixture (really No. 4 recipe) is far and away better than either of the others. Wood charcoal is, in fact, rather a poor packing material when used *alone*.

Each curve is assumed to represent an experiment for every one of the points. As a matter of fact, only five or ten were probably made for each packing material. These were each put down as a dot, when the eye would show how the curve ought to be drawn. That is one of the great advantages of using curves. We get information as to experiments we did not actually try.

Not Always the Same Results

I should introduce a caution perhaps at this point. I have been giving results gotten by experts such as Guillet and Shaw Scott. The reader may try to follow them and fail to get the depth of shell in as short a time as these experts succeeded in doing. Or, he may possibly get the depth in less time. Such differences are bound to occur.

Furnaces differ, steels differ, the ingredients in the packing material differ. The boxes may differ also. And the lightness or looseness of the packing material may be different. In view of the unavoidable differences, the reader is to expect results that do not exactly agree with those I have been giving as obtained by these expert experimenters.

If these articles succeed in explaining the case-hardening procedure to the extent that the reader either decidedly improves his present practice or adopts a thoroughly good practice, they will have accomplished a sufficient object. Some of the details will be lost. Even if the reader gains no more than to learn of a packing material better than what he is now using, he will get something of value from the articles.

There are three ways of impregnating steel with carbon—(1) by the use of a liquid (as molten potassium cyanide), (2) by the use of a solid packing material (as charred leather), and (3) by the use of a gas containing carbon in the proper manner. The last is undoubtedly the very best. But it requires apparatus. If the reader has enough case-hardening to do to warrant his purchase of an outfit, that is certainly the best thing to do. However, there are mixtures of solid packing materials that probably approximate in their advantage the various gases. Some of these have been already indicated by certain of the recipes. Advantageous packing materials are those numbered 3, 4 and 6.

Diagram Shows Three Packing Materials

These packing materials—Nos. 3, 4 and 6—are to be regarded as *mild* or *gradual* agents for impregnating carbon in steel. But, even such packing materials may have a *sudden* action, if the temperature is made high. In the diagram showing three kinds of packing materials, the results are based on a temperature of 1652° F. (= *orange*).

Probably, any one of these packing materials would act more quickly if the temperature were increased 200° or 300°. Let me quote from Giolitti some remarks relative to the mild or slow packing materials: "These cements (packing materials) are used with advantage whenever it is desired to obtain cemented zones (impregnated shells) of medium or great depths." By "medium or great depth," he means, as he explains, depths greater than 0.04 or 0.08 inch, and on up to 1.00 or 1.20 inches. Such packing materials as Nos. 3, 4 and 6 may be expected to operate in such way that after hardening they will possess a minimum brittleness and a minimum tendency to "peel off" on the outside.

On the other hand, the packing materials indicated by recipes Nos. 1, 2, 5, 7 and 8 are to be regarded as *sudden* or *quick* acting packing materials.

In illustrating a slow packing material becoming a quick or sudden one by a suitable increase in the heat, I may follow Giolitti in giving some facts as to No. 4. The packing material contains 40 per cent of barium carbonate and 60 per cent of powdered wood charcoal.

If used with a temperature under 1652° F. (= *orange*) and with big articles (which get hot slowly), No. 4 may be used to produce shells more than 0.08 inch thick. These shells may not have any of their layers consist of steel containing more than 0.90 per cent of carbon. But if this same No. 4 be used at temperatures higher than 2012° F. (= *light yellow*), it can be made to act so quickly on small objects (which heat up rapidly) as to produce a thin outside shell containing 1.50 per cent car-

bon. That is, these small articles will have a coating of razor steel.

Test Pieces

It is often necessary, or at least desirable, to use test pieces or "tell-tales" in order to learn how things are going in the furnace during the impregnation of the work with carbon.

Rods of soft steel are suitable for this purpose. The diameter may be 0.30 inch. This is about 5/16 inch or a little less. This size of rod is the thing when the work consists of small pieces. If, however, the work should consist of large chunks of metal, then "tell-tales" of a larger diameter are to be employed.

These test pieces may be bent round at one end to form an eye or ring. The diameter of the hole provided in the lid or other part of the box or tube will naturally have to be larger than the diameter of the rod. If it is made 3/64 inch larger, the diameter of the whole will be about right. The test pieces may themselves be short. That is, they may be made just long enough to provide for the introduction of the straight end all the way into the box and almost to the opposite side. The eye would then be just outside the box.

In order to secure the test piece at any time it may be wanted, one uses a special rod with a hook at one end. This end is hooked in the ring and the test rod withdrawn. Several such test rods are to be provided, and naturally the necessary holes in the box. Then, one will be withdrawn at one time, another at a later time, and so on. The intervals may be made 30 minutes long or 45 or 60 minutes.

Using the Test Rod

When the first test rod is pulled out, it may be immediately plunged into the quenching bath. This will usually be a water bath or else one of oil. After the test piece has been properly quenched, a piece may be broken off of the end that was inside the box. The operator can then examine the fracture with the naked eye or with a hand magnifying lens and note whether there is a ring around the edge of the section. That is to say, the impregnation of the surface shell of the test rod with carbon will, after a time, disclose itself by means of a difference in the appearance of the steel. The impregnated metal will look different from the metal not impregnated. The result will show as a ring.

The test piece is to be broken so as to present as flat a section as possible. It could be nicked on opposite sides and the break then made. The ring ought to show all round, except of course where the nicks were made. By means of this ring, one can note more or less successfully, the *depth* of the impregnation and perhaps whether the carbon is being absorbed in sufficient amount.

One expert, Gienet, thinks that one test piece per box is enough, unless the box is of considerable size. With this opinion Giolitti coincides. The way to use a single test piece is to manage the heat of the furnace without its assistance, for the most part. The temperature of the

furnace may be determined by means of *Segger cones*. The reader may expect information as to these useful cones later on. Just now, it will be sufficient to point out that *Segger cones* afford a very good means of determining the heat of the heating chamber of a furnace. They are of use for other operations besides those having to do with case-hardening.

The furnace will be managed, then, principally in some other way than by means of the test rods. One will, perhaps, calculate about how long the job of heating will last. When half or three-quarters of the time has gone by, the test piece may be pulled out. After some experience an intelligent workman will probably have some idea whether the ring round the edge of the fracture indicates that the job is really half or three-quarters over. The result of the examination may inform the workman sufficiently so that he will be able to know whether the furnace is to be heated up more, the remaining time prolonged, or the time shortened.

Expense of the Process

What should be the expense of case-hardening? This is an important matter; but unfortunately nothing very exact can be said. There are too many different packing materials, furnaces, ways of handling the work, etc., for one to be able to give very useful figures. However, some idea of the cost may perhaps be obtained from some figures given by Giolitti before the Great war. Presumably, these figures applied particularly to Italy. In effect, these costs were, for the minimum expense, 1.8 cents per pound of work. The maximum was equivalent to 8.2 cents per pound. In the United States, a shop devoting one day per week to case-hardening might perhaps expect to do a total weight of 50 pounds of work at the rate of 25 cents per pound. This is three times Giolitti's highest figure; but we are now living *after* the War. Besides, the United States is not Italy.

PLACE FOR THE KNIVES

Most paint shops have the painters knives all over the bench, all for want of a simple method of keeping them orderly.—Nail a broad strip of tin underneath the shelf directly in front of you as you stand at the "stone." See the nails are wide apart and that the tin is loose, not close.

Now you can slip the point of the palette knife in between the tin and the wood. Next to it are putty knives and stripping knives, all with their handles in a row, ready for you to seize, and always conspicuous.

Coach and Motor Builder Melbourne, Australia.

—"The Newriches occupy the street floor, I understand. Do they associate with the people in the other apartments?" "No, indeed; they consider the people above them beneath them.—*Boston Transcript.*"

Putting Grease on the Car

When Your Workmen Attend to a Job
Do They Grease Up the Upholstery?

By F. L. Allen

ONE of the secrets of success is careful attention to details; a grain of dust in the eye looks larger than a carload of rocks in the desert; one spark in a tank of gasoline is of more importance than a fourth of July bonfire; it's all a matter of comparisons. Forget the small details of indorsing a million dollar check and it isn't worth ten cents.

The matter of a little grease is nothing to be alarmed about in the large service station where grease is purchased in 500 pound lots, and where every mechanic feels himself to be a "greenhorn" unless his overalls are spotted.

But put two, small, innocent gobs of grease on the running board or cushions of a nicely upholstered car and they assume the proportions of a Civil War and their cost is reckoned both in dollars and lost custom.

Too few proprietors of garages and repair shops pay attention to cleanliness. By this we do not mean to infer that floors should be scrubbed with soap every day and that the mechanics should wear high collars and sport shirts, but that the cars in their charge are treated all too carelessly as far as cleanliness is concerned.

Although a clean shop, or orderly shop inspires confidence in the mind of the patron, the condition of his car, after he takes it out of the shop, is the thing which counts most.

Not long ago the writer visited a large service station near the city of New York where everything is supposed to be more than up-to-date, in fact assumed to be a few steps ahead of the times. At the time the writer visited the place two mechanics in extremely dirty overalls were making some repairs on an engine. One of the men was on his back beneath the car, the other working above. The repairmen alternated positions every little while and I could see the shine of fresh, gooey grease on their backs from heels to heads.

Dirty Clothes and All

Having made the proper repairs and adjustments both mechanics hopped into the car, dirty clothes and all, and drove out on a trial run. The car was a new Hudson, light grey upholstery and as neat and clean as a good manufacturer knows how to make a machine. Just out of curiosity I waited for the car to come back and the men get out of it. The condition of that upholstery was such that it amounted to a crime. Had I been the owner of that car I would have sued the shop and would have taken care that due publicity was given to such slovenly methods.

There is an excuse for dirty clothes, for dirty pits and oily floors in a garage, but there is absolutely no

excuse for the transfer of such filth to the cushions of a customer's automobile. We are all familiar with the old, sarcastic sign, "Unless you spit on the floor at home, please don't do so here." The same idea might be incorporated, by the customer, in a sign inside his car, which might then read somewhat as follows; "Unless you are accustomed to sit in your parlor in your dirty overalls, please don't do so inside my car. But even if you don't care about your parlor upholstery, I care about my car and its cleanliness."

How Cars Should Be Protected

In one garage where I visited I found that the mechanics were trained to put paper over the seats and backs of all cars before they got into the machines; a roll of wrapping paper was mounted on the wall of the shop for this purpose. In another garage I found them using paper towels; in another they were using heavy canvas strips which had been waterproofed. The strips of canvas were provided with eyelets and several were kept hanging on the wall. They were washed once or twice a week.

Personally I wouldn't patronize a garage after I found out that the mechanics were careless and slovenly with my machine and I know that every neat automobilist feels the same way.

The careless use of grease often works other evils than merely damaging the upholstery. I have a friend who recently had a rather bad accident simply because his brakes refused to function properly at a critical moment.

In this case the repairman had removed both rear wheels to install a set of new axle bearings. He had coated the brake bands liberally with grease, unintentionally I trust, and the bands naturally would not function.

Grease is a small item, relatively unimportant in some ways, but it is one which must not be ignored by the owner of the repair shop.

The purchaser of advertising is short-sighted, indeed, if he does not take into consideration the gradual building up of a public sentiment, a public opinion, with respect not only to the articles he offers for sale, but also to the reputation of his concern.—*N. C. Kingsbury*.

Guaranteeing satisfaction or money back is not honesty. It has become almost a matter of necessity in these days of keen competition.

That Universal Joint

How This Important Unit Is Dis-Assembled and Repaired

By F. A. Phillips



AN annoying squeak which defies all finding and which hides beneath the car until you decide to take a Sunday drive; a squeak which starts with a murmur and grows to a shrill whistle at 15 miles an hour; a squeak which whistles so loudly at 20 miles an hour that it attracts all the traffic officers in the neighborhood and warns those in the next township that you are coming, is a squeak which must be suppressed.

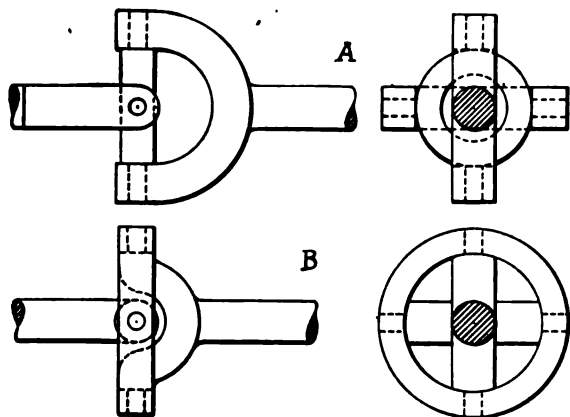


Fig. 1. Fork and Spider and Fork and Ring Types of Universal Joints

Unless you happen to know where to look for the squeak you may drive for weeks with its constant noise somewhere beneath the car, when, all of a sudden it is no more. If you are an old driver you will be more worried about the strange and sudden quit than you were about the original noise.

As a general rule, those squeaks which exist only when the car is running along the road, which cannot be produced by jouncing the car while it is idle, are to be found either in the universal joints, or the rear axle.

The universal joint is a badly overworked member. About the only part of the car that should receive plenty of lubricant, which is not provided with a lubricating cup. Few universal joints are easy to lubricate, though some are more difficult to reach than others, but nevertheless this joint needs oil or grease and plenty of it all of the time.

The universal joints commonly used for transferring the power from the gear-set to the rear axle may be divided roughly into two classes, forks and rings and forks and spiders. In either class the principle is the same, to obtain a double joint having but one center.

In Figure 1 at A is shown the fork and spider type while the fork and ring type is illustrated at B. The Ford universal is of the type illustrated at B.

If you will examine a universal joint you will see that it is really a double hinge and that the two parts can be swung in any direction, but always upon one center, the center being the intersection of the axes of the two forks. The simplest form of a universal joint is illustrated in Fig. 1 at A. It consists of a spider, or cross, which is nothing but two studs set at right angles to each other, and two forks, the driving and driven members.

Assembling the Joint

The assembly of such a device would seem to present some very peculiar difficulties and I have seen many trained mechanics puzzled when confronted with the problem of taking one of these joints to pieces. The ends of the forks are drilled with holes large enough to take in the largest portion of the spider arms. The spider is first assembled with the forks, an easy matter with the large holes in the forks; then a bronze bushing is slipped over the ends of the spider and forced into the fork holes.

Anyone with a hammer and a block of wood can assemble a universal joint, but when the bushings fit tightly it is often a big problem to get the bushings out. In disassembling such a unit, the whole joint is put beneath an arbor press and pressure applied to one side of the spider, thus forcing out the bushing on the opposite side. It is to be remembered that the bushing may be pinned into place or, perhaps held by a set screw, but usually the bushings are held only by friction and prevented from falling out by the housing.

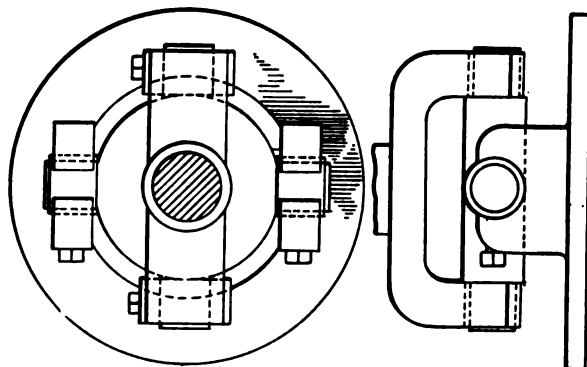


Fig. 2. Fork, Spider and Flange Type of Universal

The universal joint shown at B, the fork and ring type, is a popular design because it can be turned out so cheaply. The two forks are forged to spread out in the shape of the letter Y and the ends form bearings in the ring member. The ring is made in two parts, usually of hard bronze and riveted together. A bronze ring, bearing against steel journals is a good combination, is

easily made, requires no bushings and is easy to assemble. Once the bearing is worn, and the bronze ring usually wears without affecting the forks to any extent it is an easy matter to drive out the rivets, remove the ring and replace it with a new one.

The universal joint illustrated in Figure 2 is very popular because of its excellent features. It is not a cheap joint and consequently is not used on the cheaper makes of cars, but if the average car owner were to realize its value, he would insist upon its installation in preference to some of the other makes, regardless of price.

This joint, (Fig. 2), might be classed with the fork and spider types, but it differs from them in one particular, the forks are really rings which carry projections, which, in turn fit over the ends of the spider.

The illustration clearly shows the construction. Each of the fork members is bushed with bronze and the bushing is locked in place by a bolt. No arbor press is required for removing or installing the bushings, as a rule.

Advantages of this Joint

The one big feature of this joint is its accessibility. With the above described types of joints it is necessary to drive off the parts from the shafts to make ordinary repairs, but the removal of a few bolts is sufficient in this case and the joint may be taken from the car for repairs. With this type of joint, too, it is possible to disconnect the propeller shaft from the transmission system without disturbing either the axle or gear-set.

Since we are concerned only with the lubrication and upkeep of universal joints, we need hardly mention those joints which employ fiberoid, leather or similar substances to form a flexible union. Such joints, the Thermoid-Hardy for instance, seldom cause any trouble except from actual breakage of the parts and therefore require no attention or lubrication.

At every turn of the propeller shaft, the two hinges of the universal joint are moved backward and forward. The wear upon the parts is not even and consequently the bushings or rings are usually found to be worn with oval holes. Once the holes are worn, the whole assembly is thrown off center and a big strain is put upon the working parts of the car.

Any appreciable amount of back-lash or lost motion is immediately reflected in the action of the car. Assume for instance that there is considerable play in the universal joints. Low gear is to be used and the car is on an up grade. When the clutch is engaged the shafts and gears between the engine and the universals are set into motion. Before the back-lash is taken up there is considerable momentum in the parts and the engine power goes through to the rear axle with a snap and jar which is bound to strain the differential and wheels.

The universal joints are usually surrounded with a housing or leather covering and it should be the habit of the driver to fill this housing or covering with grease every thousand miles. It is not advisable to use heavy,

cup grease only, but to use a fairly light grease every second time the joint is lubricated. In this way only can you be sure that the lubricant will be worked into every part.

Properly lubricated a universal joint will last as long as the car itself, but once it is neglected, once it starts to wear, and it will melt away like the snow in the spring. And a worn universal joint will absorb an unbelievable amount of power.

So the next time you hear a squeak beneath the car, look at the universal joint, maybe it is calling for help.

HEADLIGHT TROUBLE

FOR the past few months my headlights had been acting in a peculiar manner; the car is new and I had no cause to suspect the wiring as I might have, had the cables been soaked with oil and grease.

While the car was standing at the curb, with the lights on, the illumination was excellent, but just as soon as I drove it over a rough road, where I needed light, I didn't get it. The bulbs would flicker and burn dim. Stop the car and everything seemed all right.

I couldn't very well trace the trouble while the car was stopped, mainly because there was no trouble then and it was as much as my life was worth to try to chase trouble at 35 miles an hour on a rough road.

Now my wife is always ready to give a suggestion about the car, on any excuse, perhaps more ready to give than I am to receive. But in this case she really helped. One night, while we were driving along, lights acting like Sam Hill and worse, she pointed to the ammeter and asked me why the hand kept hopping all over the place. And sure enough, when the lights went down the hand jumped to the extreme limit of "discharge."

Of course I knew what was wrong right away, a short circuit in the system somewhere; easy enough to know about but not so easy to find as I soon realized.

I chased out every wire in that lighting system and they were as good as new, not a break in the insulation, not a chance for a short circuit. I installed a new set of wires and was rewarded by a test of the same trouble, only worse, for this time my engine would hesitate and wait for the lights to come on again. To say I was puzzled is like saying that a man is worried when he is falling from a mile high aeroplane.

And then I opened the headlights, examined the connections—then put in new sockets. Was ready to sell the "haunted" car at the next chance for I had replaced everything in the system, almost, with new. I had about decided to cure the trouble with a heavy hammer and fix those confounded lights for good, when I finally woke up. And now my lights are as tame as cows and I'm so proud of my cleverness that I'm sending this article to you for the benefit of others who may be in the same fix sometime. What was the trouble? Sure, I was just going to tell you.

I removed one of the reflectors, which also contained

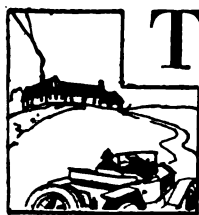
the bulb socket and happened to notice a small, round, bright spot on the headlight body behind it. I measured the distance between the lens and the end of the bulb holder, then compared it with the distance between the front of the headlight body and its back and found them approximately the same.

The answer was right there, the back, center contact

of the bulb holder rubbed against the headlight body and grounded the system. I didn't want to alter the focus of the light so I took a round end hammer and dented the headlight body, right in the center of the back, just enough so that it would clear the holder. Then I glued a small piece of tape over the end of the holder. That killed the spook in my lights.

Health Hints for Welders

In Handling Welding Gasses the
Greatest of Care Must be Exercised



THE oxy-acetylene welder's trade is not particularly hazardous if a reasonable amount of care is taken in installing and operating the apparatus; in fact it is not as dangerous as a number of other lines of work. But at the same time it is not fool-proof, nor a plaything for careless or indifferent workmen.

To insure maximum safety there are several rules which the torch operator must obey and a number of minor laws he will do well not to over-ride. He will find it pays in the long run to consider safety first. Not only safety to his person and to others around him but to his machinery and tools; bodily safety to himself and a longer life to his welding apparatus.

Take first the elements of the welding flame: oxygen and acetylene gas. In the average repair shop the former is no longer obtained by generation but comes ready for use compressed in steel bottles or tanks. And the use of tanked acetylene also predominates, although there are many shops that generate their own acetylene in special generators for that purpose. So we will touch upon the subject of both kinds of acetylene in order that the novice may be well posted on the two phases of gas supply.

In relation to the factor of safety in regards to oxygen, the welder is repeatedly warned to keep oil away from all parts of the oxygen apparatus. In other words, oil or grease of any kind should not be applied to any parts of the torch, regulator or valves, or gauges and tank connections. And to be absolutely safe this rule should include any kind of oils or grease, paint or white lead, and even soap. If parts do not work easily they should be re-threaded dry but never oiled. And if new parts are oiled when they arrive from the factory they should be thoroughly cleaned before attaching them to the oxygen supply.

Oil and Oxygen

The reasons for these precautions are that when oil comes in contact with oxygen under certain conditions of pressure and velocity it forms the ideal combination for spontaneous combustion and a violent explosion. Manufacturers continually caution welders against using oil on oxygen equipment.

By itself oxygen is non-combustible. It will not burn but is the greatest promotor of fire known, and for that reason the operator should be careful about greasy clothing and about allowing an accumulation of litter in the vicinity of the welding department. An accidental spark may ignite his clothing and result in a serious burn if the oxygen pressure comes in contact with it. The oxygen



Store the Oxygen Tanks on the Shady Side of the Shop and Keep the Metal Caps in Place over the Safety Plugs.

is under tremendous pressure, approximately 1800 pounds, so it is easy to understand the effect in event of a sudden leakage in some part of the equipment.

Oxygen expands when heated; in fact the pressure increases about in proportion with the increase in temperature. Which is not essentially dangerous because each tank is provided with a safety plug or core of soft lead, which, in case of fire, will melt out and permit the oxygen to escape before it can expand enough to become explosive.

But on the other hand excessively heated oxygen is bad for the welding flame; it will not operate according to

specifications for the capacity of the torch; difficult welding and poor welding are the results.

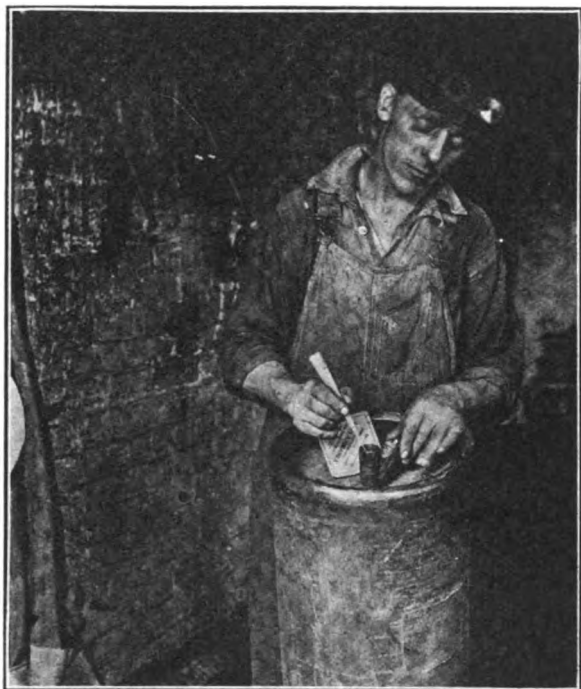
Store in Cool Place

A little thought along this line should convince the welder that he should not store his extra tanks of oxygen in the sun or near a heater of any kind. Or, to put it the other way: Oxygen tanks should be stored in a cool dry place when they are full; and never used close to a fire.

And on the other hand the oxygen tanks should not be left out of doors in winter or stored in a cold place, because the normal filling pressure decreases as the temperature is lowered in about the same proportion as it raises when the tank is heated.

A certain amount of water vapor forms in the oxygen tank, due to expansion and other causes. This may collect in the valve and freeze. In which event the welder is particularly cautioned against attempting to thaw the frozen parts with the welding flame or other fire. The valves should be thawed with warm water or be allowed to thaw themselves in a warm room.

In event of water in the oxygen tank, it should be ex-



Clean Any Chance Sediment From the Tank Valve with a Soft Pine Splinter.

pelled before attaching the regulator valve. In fact it is a good idea to test all tanks whether there is doubt about water content or not. This testing is not a complicated process and may save considerable trouble later. It is necessary to merely invert the tank and allow it to remain thus for a few minutes so the water can collect near the valve. Then expel the water in jerks by successively opening the tank valve. These sudden gusts of pressure will throw out the moisture without wasting much gas.

Sometimes a little dust or oxide gathers in the tank valve. It should be picked loose and expelled, in the same manner as the water, before attaching the regulator. The foreign matter is liable to enter the gauges and valves.

even find its way to the torch; in either event having an adverse effect upon the welding flame and upon the quality of the fusion.

Under normal conditions there is small risk in dropping or jarring the tank of oxygen. But at the same time it increases the wear and tear and is likely to break some attachment.

Now in considering the other element of the welding flame we find that just the opposite condition prevails. The acetylene is highly inflammable and explosive and must be handled more carefully, particularly the kind that is generated at home. The acetylene generator should be isolated in a separate room. Or at least separate from the welding shop in order to preclude danger of flying sparks and sudden leakage.

No Admittance to Generator Room

No one should allow access to the gas generating department except the welder or the person designated as attendant to the generator. Fire, cigars, pipe, matches, or cigarette smoking is barred from the vicinity of the acetylene generator, especially when charging or when cleaning tanks. And the operator should never go near the generator with the lighted torch in his hand; particularly with any intention of making repairs.

If the charging requires to be done at night it should be done in the dark or by electric light; never with an oil lamp or lantern. An explosion may not *always* occur but the risk is great.

The operator should always follow his manufacturer's instructions explicitly in regards to cleaning and recharging the generator tanks or hopper. To allow carbide residue to gather and pile up in the tank is to invite disaster like that shown in one of the accompanying illustrations. In this case the water was not changed at proper intervals as instructed, so the carbide built up on the thickened sludge to fall over into the water all at once and thus create a tremendous pressure suddenly. This terrific pressure blew the bottom out of the generator and threw the whole thing through the roof and side of the brick generator shed.

When cleaning out the generator tank the operator must not be content with merely opening the outlet valve and allowing the lime water to escape. He should keep the agitator moving, turning briskly while he pours large quantities of fresh water into the intake.

Now, as there is not space here to cover all phases of each subject let us consider the tanked acetylene. Which, everything taken, is no doubt the safest and best way to use this highly inflammable gas. It is not so particular about storing the surplus tanks except that they should not be kept close to a fire. Nor is it good practice to keep these tanks in freezing atmosphere, particularly after wet weather, as the valves may be damaged. Although as a whole the dissolved acetylene is not affected by lowering the temperature.

The welder should scrape and blow out any sediment which may have collected in the regulator attachment.

This is done in the same manner as the oxygen except that it is not usually necessary to invert the tank.

The cylinder of compressed acetylene can be handled without special precautions. The welder simply avoids deterioration by violent shocks, falls and so forth. The valve end of the tank especially is protected. Each tank is supplied with a safety plug which will melt at a low

an explosive gas is formed to ignite when the weld is sufficiently hot. If there is no water inside the gas may generate in quantities sufficient to blow up the container. But the water keeps the container cool, and still more important, cuts to a minimum the space in which the explosive gas may form, thus cutting down the power of it.

An Eccentric Gas Tank

One of the photos accompanying this article illustrates the result of attempting to weld a tractor gasoline tank without filling it with water. No one was seriously hurt in this particular instance; the torch operator's chin was lacerated and his throat and chest painfully scorched. The tank had been thoroughly washed out but was not full of water when the welding was done.

Don't open the oxygen tank valve without first releasing the extension spring of the regulator valve. Back the regulator screw out with the left hand and then open the tank valve by turning the hand wheel with the right hand. This method prevents the heavy pressure from injuring the delicate interior parts of the regulator and gauges.

Don't stand directly in front of the gauges when opening the tank valves. The sudden entry of the heavy pressure may burst the gauge and injure the eyesight. This is more likely to happen with some cheaper grades of equipment than others but for the sake of safety first the operator will stand to one side when opening the tank valves.

Don't wear leather gloves when welding; the leather absorbs heat and holds it too long. Cotton gloves may be instantly cooled by dipping in water, without damaging them.



Release the Regulator Screw with the Left Hand Before Opening the Tank Valve with the Right.

temperature and thus permit the gas to escape gradually in case of fire. If there is a leak in the torch, hose, gauges or regulators the tank valve should be closed immediately. If the leak happens in the tank valve all fire should be immediately extinguished whether it is on the tank or in the vicinity. Usually an ignited tank leak may be extinguished by smothering it with a thick rag.

Lack of space again bids us cut down the amount of pointers which could be incorporated herein. Therefore let us take a list of important "don'ts." Without regard for classification.

Welding Steam Pistons

Don't attempt to weld a steam piston without first drilling a hole in one head. At least one welding shop in the West had the entire roof blown off by an exploding steam piston. The drilled hole may be small and easily welded full of new metal after the main weld is finished, but it permits the pressure to escape gradually and thus prevents an explosion.

Don't weld oil barrels, gasoline tanks or other metal containers which have been used for oil, distillate, turpentine, or other gas generative liquid, without first filling them with water. Even though the container is known to have been empty for a long time it is risky business to weld it without filling with water before the welding is started and keeping it full during the welding process. It should be as nearly full as the location of the weld will permit.

When the barrel or other vessel is heated by the weld



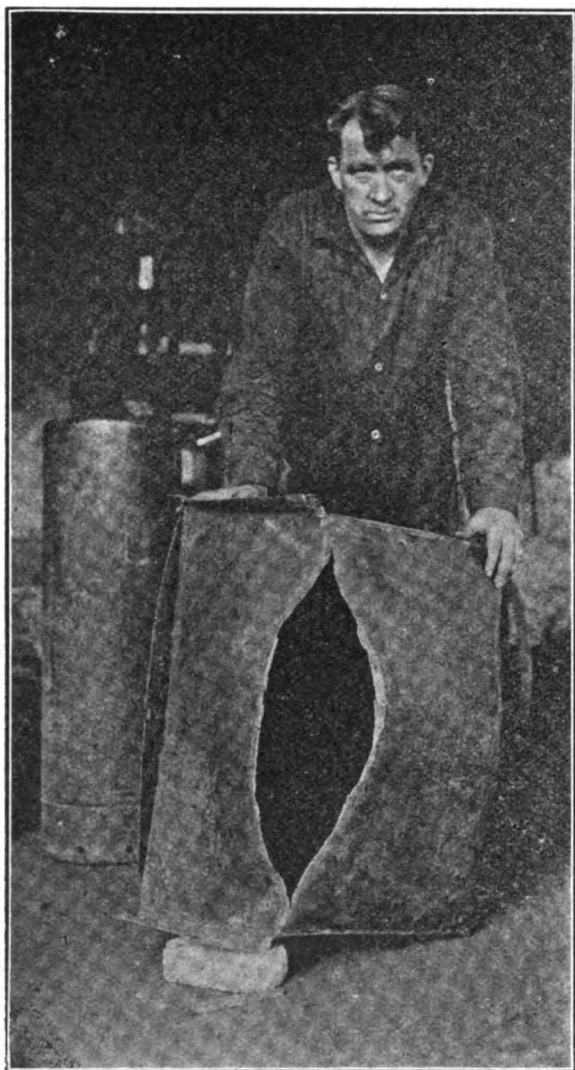
Almost a Total Wreck! The Acetylene Generator Was Not Kept Clean from Carbide Sediment.

Keep the Tank Capped

Don't neglect to keep the protecting cap in place on the oxygen tank when it is not in use. The cap not only protects the thread and seat but it also protects the fusible safety plug. This soft plug should be free to melt out in case of fire in the shop. Both the cap and plug are clearly shown in an accompanying illustration.

Don't do long jobs of oxy-acetylene cutting where a heavy pressure is employed without having a helper conveniently near to shut off the oxygen in event anything happens to cause the hose to leak or get unfastened at the torch or tank connection. The tank valve should be closed the moment trouble appears. This is particularly urgent if the operator is working in such close quarters he cannot escape.

Don't cool the welding torch by dipping it in water unless it is absolutely necessary. The sudden contraction is bound to affect the tight fit of the parts sooner or later.



The Result of Trying To Weld a Gasoline Tank Which Was Not First Filled With Water.

When it is necessary to cool the torch thus, the acetylene gas should be shut off entirely but the oxygen should be blowing through enough to prevent the water from entering the interior of the torch to rust or corrode it.

Don't use the torch for a hammer or crow bar. It is an instrument of delicate precision and should be treated as such if the operator expects it to measure up to standard.

Don't throw the welding tips around as if they were merely bits of scrap metal. A slight dent in the gas outlet may destroy the efficiency of the flame, causing it to pop out or to melt poorly.

Don't try to repair a damaged regulator unless you know how; send it to the factory or get a new one.

Don't try to put new packing in the tank valves unless you know your business. You may blow the entire contents out of the tank. The leaky tank should be returned to the manufacturer labeled with the reason for so doing.

Don't try to weld heavy jobs with a light torch and vice versa. Have two torches on hand or a heavy torch equipped for light work.

Don't allow the welding hose to trail upon the floor in the wet and grease; it will last longer if it is kept clean and dry. A dented hose soon becomes leaky and is liable to burst under sudden heavy pressure.

Don't risk burns by lighting the welding flame with a match. The patent spark lighters are safer and cheaper.

Don't be easily discouraged if the welding doesn't go as it should. Keep practicing and watching the effects of the flame on the various metals. It also helps to examine the bits of metal after they are cold; remembering at the same time exactly what took place during the melting.

And last but not least don't cuss the apparatus if your welding is not good. Examine your method and see if you are following every single detail of the manufacturer's instructions. Maybe you should cuss yourself instead of the torch.

A Dedication to My Flivver

You can talk about your car and all its splendor,
Of its price which puts all other cars to shame,
Of the shine upon its nose and its yards of copper hose;
And the great depth of its special alloy frame.
But me, I like my dented, time worn Flivver,
With its fenders seamed with cares of many years,
For its twenty thousand rattles, tell of many hard fought battles,
And its every squeak is music to my ears.
You can talk about your sixty miles an hour,
And how you take all hills in highest gear,
How she'll throttle down like magic, in the slowest kind of traffic,
And run up two hundred thousand miles a year.
But me, my speed is never more than thirty,
And then the flivver rattles like a bone,
She won't run slow in traffic, the engine acts erratic,
But she always gets me back again to home.

Do not imagine that many persons are lying awake nights worrying over your troubles.

Nuggets of Automotive Wisdom

Hints, Suggestions, Facts and Helpful Information Gathered By An Expert For Your Aid

By Joe Bell

EXPERT advice and the opinions of specialists very often confirm what the seeker thought himself. A mechanical engineering expert once said: "When any serious minded person comes to me with a problem on which he has been thinking, I find that in four cases out of five he has thought out the best solution himself—all he lacked was the confidence to believe in his result or a refinement or two prompted by a wider perspective." I thought of this statement one Sunday morning when my neighbor, Mr. Barnes, asked for advice about his Bear Cat's heating up.

He said he thought the heating had something to do with the spark's not working—he had noticed that there was no acceleration of his engine when he pulled the lever down. (I fear Neighbor Barnes is a Christian Scientist, for a little action, after he had taken thought on the subject, would have remedied his trouble.) Taking him at his cue, I followed the spark line from the wheel down.

Sure enough, ahead of the dash, on the inside of the post, where the arm runs to the timer was the trouble. One of the ball joints had loosened so much that the entire movement of the spark lever was lost. It was the work of but a moment to tighten the nut and insert a cotter. The car worked so differently on the road after that that Mr. B. didn't hesitate to tell his friends of the expert who had helped him out.

Another case of The Retarded Spark came to our notice. Charlie Roesch had purchased a big Paige and was proudly taking his wife and daughters with him on his first trip alone. Charlie had been taught to use the foot throttle only and to run with the spark shoved all the way in the corner. Wife and daughter got in the rear, Charlie started the engine, pushed one of the levers all the way, and let in the clutch. With a roar and a jerk the car shot up the street in low.

Somehow he managed to get the gears shifted but, inwardly, he knew something was wrong and he headed for Middletown and the man that sold him the car. That Paige certainly did run. But much as he enjoyed speed, Charlie's trip was not an unalloyed pleasure. It seems that the girls had been absorbing automobile information for several months, on the q. t., and really knew as much about the car as the driver. As soon as they had made sure that their necks were not broken from the rude getaway, the chorus began. "Charlie, push that throttle back before we all get killed." "Why Pop, you're driving with the wrong lever." "You've got your levers mixed—see, the engine's heating up already!"

But Charlie was stubborn and insisted in driving the

car his own way; he made Middletown in the record time of eight minutes. Later he admitted that he couldn't understand why the car only slowed down when he pushed out the clutch. Moral: women know more than you think they do—listen to 'em anyway.



SOME cars are built with cantilever springs that run close under the frame, well up toward the center of the car. In such a position, the spring is behind the fenders, a location that makes it almost impossible to lubricate the leaves. Grease cups or some form of oiling system take care of the bolts well enough but the leaves never get any attention at all.

There is one simple and fairly effective way to treat these springs and others that are not get-at-able. The tools required are a flat paint brush—a new one—and a little rather heavy oil in an open container. With these, paint the springs just as if putting on paint. Apply thoroughly to both edges of the pack. In time some of this will work in from movement of the leaves and some will follow by capillary attraction. The coating protects from further action of water from the outside.

Rust is the enemy of springs. Its corrosion lessens the cross section or resisting area, and the grip of the dry surfaces prevents sliding to such an extent that when a big bump is encountered, friction is finally overcome and the leaves go with a snap. No car should be condemned as hard riding until spring leaves and eye bolts are given a chance to operate as they were intended to. Thorough lubrication is the secret of spring success. When springs are oiled, the car should be jacked up to relieve the weight on them—when this is done the leaves will separate farther and much more readily.

As long as we have to ride in a car, let us make the car easy riding—it is easier on our spines and easier on the car. American springs are the best in the world and American designers have applied them well—it is up to us to make them function as they were intended, which is in a condition where each leaf can move against its fellow with no more resistance than that of the weight on the leaves.

As we understand it, the railroad people complain of bad business when all the passengers get seats.

—Dallas News.

Automobile Dealer and Repairer

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M. T. RICHARDSON
President and Treasurer

F. R. WHITTEN
Secretary

M. T. RICHARDSON, Editor
FRANK L. AVERY, Managing Editor

F. R. WHITTEN, Advertising Manager
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Buying the Second-Hand Car

A SHORT time ago one of the writer's friends came to him with a plaint of woe that would have melted the heart of a stone, supposing that a stone happened to have overheard the wail and to have had a heart. This gentleman, it seems, had purchased a second-hand car and as he clearly stated the matter, "put all of his cards, face up, on the table."

The purchaser had gone to a "used" car dealer and told him that he wanted a good car at a certain price; that he didn't know anything about cars and that he would be guided by the dealer's judgment in the matter. The inevitable happened, the dealer was a person whom we might term as "sharp," and instead of getting a bargain, the unfortunate purchaser acquired a machine which would have been a poor investment at half the price.

The second-hand car game is in about the same class as was, formerly, that famed as "hoss-tradin." The buyer must beware. There isn't much new in the game, in fact it would seem that many dealers were once horse traders, and to buy a used car from such men is to take a gambler's chance.

It is not our intention to infer that all used car dealers are in the class which uses sharp practice in its dealings, we merely wish to point out the dangers confronting the buyer and to warn him against such methods.

If you are fortunate enough to know mechanics well,

to know when an automobile is good, or bad, then you have only yourself to blame if you are, figuratively, handed a lemon. But if you know nothing about automobiles and the unsteady buzz of five cylinders is just as rhythmic to your untrained ear as the murmur of all six, then don't "put your cards face up on the table," unless you know the man who is selling the car.

There are thousands of excellent bargains to be obtained in used cars at the present time. In fact, now is the time to buy a second-hand car because the market is far more inactive than it will be next year, with the opening of the roads in the Spring.

If you are an experienced mechanic, then buy your car now and spend the winter overhauling it. Figure the time that you spend in this way just as though it were spent in playing tennis, golf or checkers. The joy of riding in a car which you, yourself, have overhauled is far greater than that of driving an ordinary machine.

And if you are one of the great class of those who know nothing about machinery, then it is high time you learned and you can get no better experience than overhauling your own machine. You can always call upon a repair man and can figure the money you pay him as being a part of the cost of the car.

But when you buy your car, if you know nothing of mechanics, be sure to get the opinion of an unbiased repair man. A man who has had experience with various kinds of cars is often able to estimate, within a few dollars, the cost of repairs to a car. A glance at the wheels, a short ride in the car and the use of both eyes and ears tells him what is wrong with the machine.

Of course no man living can always diagnose troubles with automobiles correctly every time. A repair man is only human, at times he makes errors, but if you are buying a used car you can be sure that his fallibility is more to be gambled upon than the sharpness of the seller.

Some Chickens That Have Come Home to Roost

A FEW months ago we published an article relating to garagemen whom we had met; following it we directed a story toward car owners whom we had encountered at diverse and sundry times and who had impressed us favorably. Evidently we stirred up things somewhat, for we have heard from both classes of readers; to use a metaphor, our chickens are coming home to roost.

There seems to be a mistaken impression among a few of our readers that it was our intention to do some promiscuous knocking without caring whom we hit. From the context of some of the letters it would seem that we made a few "bulls-eyes." Other readers seem to think that we were taking sides. Still others, unfortunate ones, seemed to think that we had handled the matter with silk gloves and a tack hammer, when we should have donned a suit of mail and used a sledge.

Those of our readers whom we have not heard at all,

fortunately very many, evidently have taken our two articles in the spirit in which we wrote them.

The truth often hurts more than a lot of lies, and in our articles we told a few of our own experiences. In our first article we wanted to show the dishonest repairman that they were, to use a slang phrase, "not getting away with it." In the second article we tried to wake up our car owner readers to facts and to show them where they were blamable for dishonesty.

One garage man with whom we talked, a man who knows the game from over 15 years of experience as automobile mechanic and five years of previous machine shop work, in speaking of our article said:

"I'll admit the truth of your articles, but under present conditions it is impossible for a repair man to be wholly honest and keep out of the bankruptcy court. If I honestly told some of my friends the truth about their cars, I'd lose some valuable customers. They don't want the truth, they want flattery and 'soft soap.'"

When car owners come to the realization that good work deserves honest payment and that something cannot be obtained for nothing, then we will have more honesty in the garage business.

To illustrate our point we might tell the old and somewhat mouldy story of the wise men and the Persian king. It seems that the king was in poor health, mentally and bodily. Wearing a gold crown was his heaviest daily task and a few years of inaction had accumulated upon his bones an extra hundred pounds or so of flabby fat. The mere wielding of his sceptre made him gasp like a fish out of water.

Naturally the King resented his condition, it embarrassed him to be obliged to go through a door sideways and hit at all corners; he grew worried about his feet which he had not seen for months, and so called upon his wise men for help. After considerable wagging of old, white heads, and serious, long confabulations, one of the wise men told the King there was nothing the matter with him but excessive fat and that exercise was all he needed to give him the proper pep for his Kingly duties.

To say that the King was peeved is not doing the matter justice. He went up into the air about ten feet and came down, the whole 300 pounds of him, on the back of that wise man's neck. Imagine! To insult a King, by telling him that he was too fat! Off with the wise man's head, off with all the wise men's heads! And the King grew fatter and less peppy every day.

But at last came a wise doctor from the East who had heard of the fate of his colleagues. This easterner was clever, perhaps more clever than wise, but at any rate he brought to the King a magic Ball, a big thing of leather and sand which, he contended, had wonderful curing properties.

This ball was so constructed that every time it was thrown violently or impinged violently against a person, it would give off magic waves. The more often it was used, the stronger the magic, and the King was asked to try this new cure.

Day after day the King and the easterner hurled that

ball at each other and it was only natural that the King grew better in due proportion. The clever easterner was probably rewarded with an earthly palace and several hundred wives; but the wise men, the truthful ones, were obliged to obtain their reward, if any, in the world beyond.

Now had those wise men have been more clever and less wise they might have hidden the truth somewhat and fooled the King as the easterner did. The average car owner is to be compared with this Persian King; the wise men to honest repair men; and the easterner to our modern repair men who gives his customers, not what they need so much as what they want and are willing to pay for.

In our articles we pointed out various weaknesses on the part of both classes of our subscribers, we tried to be fair, we tried to instruct, we acted impartially and we honestly hoped to drive home a lesson without giving offense. The medicine we gave wasn't covered with sugar, the pill may have been bitter to the taste, but it was given in the hope that it would alleviate somewhat, even if it did not accomplish the cure. Our criticism was intended as constructive, not destructive.

What Have You Forgotten

OCCASIONALLY an event happens which leads us to believe that even the most serious things are fraught with humor. Our Editor burns the midnight oil, (or electricity), and wastes several days in compiling a few bits of what he thinks to be clever humor and his work is greeted with a penetrating silence on the part of the readers. Not even a suppressed smile rewards his efforts. And then he writes a serious article, only to be found that he has started something which amounts to a humorous mountain of mirth.

Our old readers will recall that we published, some time ago, an article relating to the subject of "Have You Forgotten—?", and we followed the heading with a number of questions such as, oil?, water?, gas?, and so on. The idea was for the garagemen to have a sign printed, inside his shop, with these gentle reminders upon it. The car owner would see this sign and remember what he had forgotten.

Until we looked over some of our old letters, yesterday, we had not fully appreciated what this article might lead to. We counted over 50 letters relating to different things that the owner might have forgotten. As far as we can see, nearly every accessory manufacturer sent us a letter suggesting that we might have added his accessory to the list.

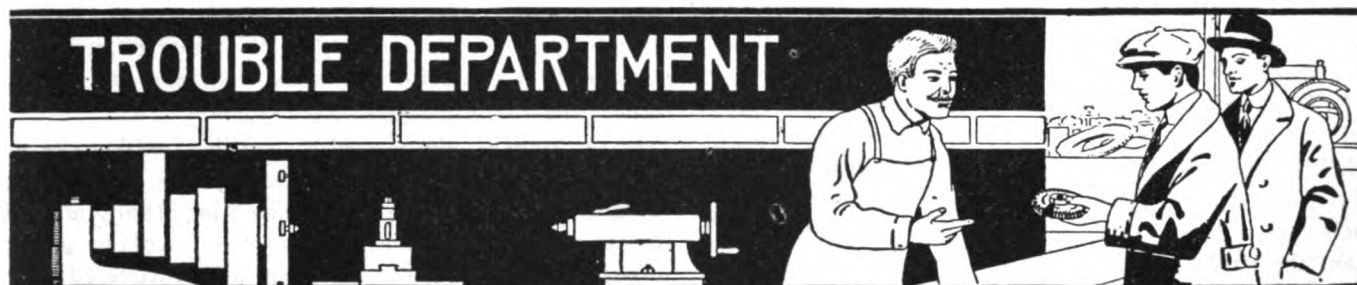
We must confess that our article was dismally inadequate to the subject, and for this reason we suggest that the garageman, or the car owner, if he wishes, print something like the following, to be pasted up in the shop or on the windshield of the car.—

Have you forgotten?—Accelerators, air gauge, air

valve insides, alcohol (denatured of course), aluminum matting, ammeter, anti-rattlers, antifreezing solution, aprons, arm rests, babbitt, back rest, bags, brake linings, battery, bearings, belting, bolts, boots, bow clamps, braces, brake adjusters, brushes, buckets, bumpers, bulbs, buttons, cable, caps, (radiator, hub and head), carbon removers, carburetors, and so on naming all accessories and products right up to Yokes. We don't think that there is an accessory made which begins with Z, but if

there is we beg Z's pardon and are sorry that we ignored him.

And with such a complete list of "non-forgettables" the average owner cannot be excused for leaving the garage without a full equipment—but, on second thought, perhaps the owner won't even find time to leave the garage, if he reads through the list. So even if he does forget anything, or if you have forgotten to complete the list, it won't matter much anyway.



Peculiar Clutch Action

3140

From Albert White, New Jersey:—I have a 1921, model F. B. Chevrolet car which has given satisfaction until lately when it developed a peculiar clutch action. The car seems to run all right until it is driven faster than 25 miles per hour, then it seems as though the engine were running faster than the car.

I might explain this a little better by comparing the sound to that made by the engine when the car is running down hill, without brakes at a high speed but with the throttle closed. In this case the car is pushing the engine faster than it normally would run, were the clutch thrown out. Every time the car hits a bump in the road I get the same noise.

The car seems to have plenty of power and will push up hills satisfactorily. I examined the clutch and know that it does not slip. I put on the brakes and let in the clutch with the engine running. This test stalled the engine so that I know the clutch is working. What is the answer to this problem?

On occasions there is a knock which seems to be in the front axle. This knock, or pound occurs when the car goes over an uneven place in the road. I have examined all spring connections and they are tight.

Reply:—We are very much afraid that you made a serious mistake in testing your clutch the way you did; by setting the brakes and letting the clutch in, enough to stall the engine. Can you imagine what would happen if you were to run the car, even at idling speed, and stop it against a solid concrete wall? But you did something almost as bad by setting the brakes and stalling the engine with the clutch for you put a tremendous strain upon the whole driving mechanism.

The correct way to test the clutch is to jack up one rear wheel, mesh the high gear and then turn the rear wheel against the engine compressing. At the same time you can check up the amount of lost motion between the wheel and the engine; two jobs at one time.

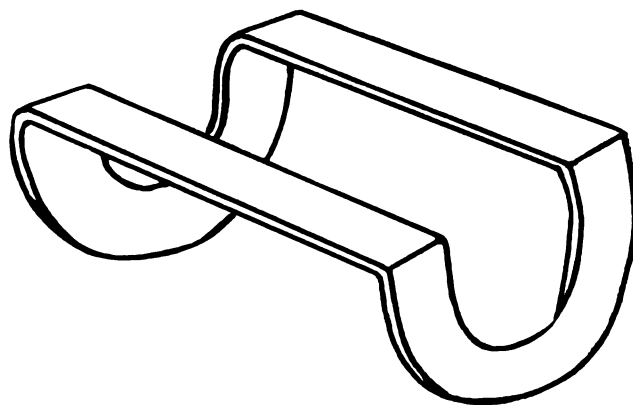
You can also test the clutch by putting blocks in front of the wheels and cranking the engine by hand.

We feel that you will find considerable lost motion between the engine and the wheels and that this is the reason for the peculiar action of your car. The pound on the front axle is probably caused by the frame hitting the axle.

End Play in Crankshaft

3141

From Quintus Sandt, Pennsylvania:—I have a Peerless, Model 56. This car has considerable end play in the crankshaft which I want to remove. My repair man tells me that the bearings and caps must have a coating of metal soldered to them, which means a lot of work and expense. Can you tell me of any easier method?



Reply:—Above I have tried to sketch a shim which I think will answer your purpose and be considerably easier than soldering anything on the main bearing caps.

From a supply or accessory store you can obtain bronze shim stock in sheets. As I remember it, the stuff comes in sheets about $3\frac{1}{2}$ inches wide and in various thicknesses; .002; .004; .005 and .007 of an inch. Four sheets to a box. The first thing to do is to cut off a piece of each stock, mark it with a prick punch so that you will always know its thickness and use it for a feeler gauge.

Move the crankshaft back as far as it will go and with one of the feelers see how thick a piece you can get between the main bearing caps and the flange on the crankshaft journal. The various clearances will probably differ. Figure on filling the space completely but without binding.

If the clearance is over .004 put a shim between the top of the bearing and the crankshaft as well as between the cap and the crankshaft. You can also make a double shim for each end of the cap if there is room. But where there is only a slight clearance use only one shim, between the cap and the shaft.

No Power In Two Cylinders

3142

From Edward Smith, New York:—I have a Scripps Booth car, 1918 model, which will not throttle to a slow idling speed. When the idling adjustment is turned to permit a low speed the engine stops. I have installed a new carburetor which works all right on another car of the same make.

When the spark plug in either number one or four cylinder is shorted out the engine will stop. Shorting either number two or three does not seem to make much difference. I changed the plugs from cylinders one and four to cylinders two and three and yet the same cylinders cause trouble.

My tests all show that current reaches the plugs. The spark between the secondary wire and the plug in each case seems to be comparatively the same for all cylinders. Will you try to help me?

Reply:—Evidently cylinders numbers 2 and 3 are not working properly and numbers 1 and 4 are doing all the work. Your test which you made by changing around the spark plugs, is proof that the plugs are all right. We can only tell you what might be the trouble, there are so many reasons that it would be impossible for us to find the exact one without getting more information or seeing the car. If you cannot locate the trouble after reading this letter you had better call up the writer on the telephone or come into the office and talk with him. We can give you much more help in this way.

Valves not working properly. See that all the valves in cylinders 2 and 3 are opening and closing as they should. Test each valve as follows. Crank the engine with the hand crank until you see the valve open and close, turn the crank $\frac{1}{2}$ a revolution beyond the closing point of the valve and see if you can get a piece of paper between the valve stem and the rocker arm. There should be at least .003 of an inch clearance at this point.

Test the valve springs by running the engine and placing a flat piece of iron, a screwdriver, between the coils of the valve spring and giving it a twist to strengthen the spring.

Try the compression in the cylinders and compare it with that in cylinders 1 and 4. You can do this by cranking the engine with the hand crank.

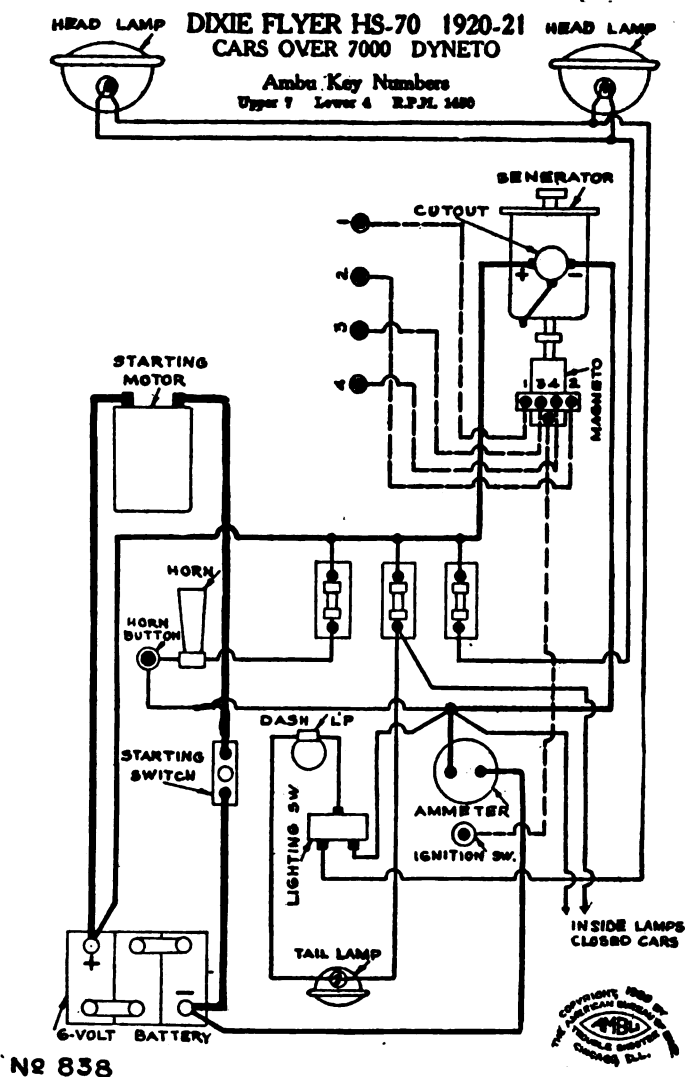
See if there are any leaks in the cylinders. Take a squirt can of gasoline and put a few drops of gasoline around the spark plug, the valve stems, etc., anywhere

there is a joint. Do this while the engine is running and watch the results. If there is a leak the engine will operate differently when the gas is squirted into the leak.

Wiring of Dixie Flyer

3143

From J. A. Wheeler, Connecticut:—I have an early 1921 model Dixie Flyer, HS-70 and would like to have you give me the wiring diagram. This car has a Dyneto starting and lighting system with high tension magneto.



N2 838

Reply:—The wiring diagram you request is printed above.

Bendix Drive Trouble

3144

From Stanley A. Perkins, Illinois: Although the starting motor on my 1921 Ford car seems to operate, it will not turn the engine over. When the starting button is pressed, I can see the shaft in the starting motor revolve, and the motor hums, but it does not seem to catch upon the flywheel. Will you please tell me what may be the trouble?

Reply: The starting motor of the Ford car is equipped with a **Bendix driving device** which is fairly simple. The armature shaft of the starting motor projects into the flywheel housing and upon its extreme end carries a shoulder, fastened to this shoulder is a heavy coil spring the other end of which is fastened to a sleeve.

The sleeve, which is mounted upon the armature shaft, is cut with a long thread and fitting over this thread is a nut, or rather a small gear which forms the nut. One side of the gear is weighted so as to throw it off balance.

Normally the gear is not in mesh with the flywheel gear but as soon as the motor shaft turns, the small gear being weighted at the side does not immediately revolve and naturally the gear travels along the shaft. At the end of the small gear's travel it is meshed with the large gear teeth on the flywheel.

When the small gear is fully meshed with the flywheel gear, it comes up against the shoulder on the end of the threaded sleeve, immediately locks itself and turns over the engine.

As soon as the starting motor ceases to operate and the flywheel revolves it throws the small gear back upon the sleeve and out of mesh.

In your case there may be two causes for trouble. Either the small gear is stuck upon the sleeve so that it does not run into mesh or the coil spring is broken.

We would advise you to remove the starting motor, an easy job, and inspect the parts. Clean off the sleeve and lubricate it well, so that the small gear will run upon

it easily. A mere glance will tell you whether the spring is broken or not.

An inspection of the device will enable you to dismantle it and replace the spring if necessary.

Wiring of Model N. Hupmobile

3145

From Herbert M. Alters, Indiana:—Will you kindly print a diagram of the Westinghouse Starting and Lighting System used on the early 1918 Hupmobile, Model N cars? This car was equipped with an Atwater-Kent Ignition system.

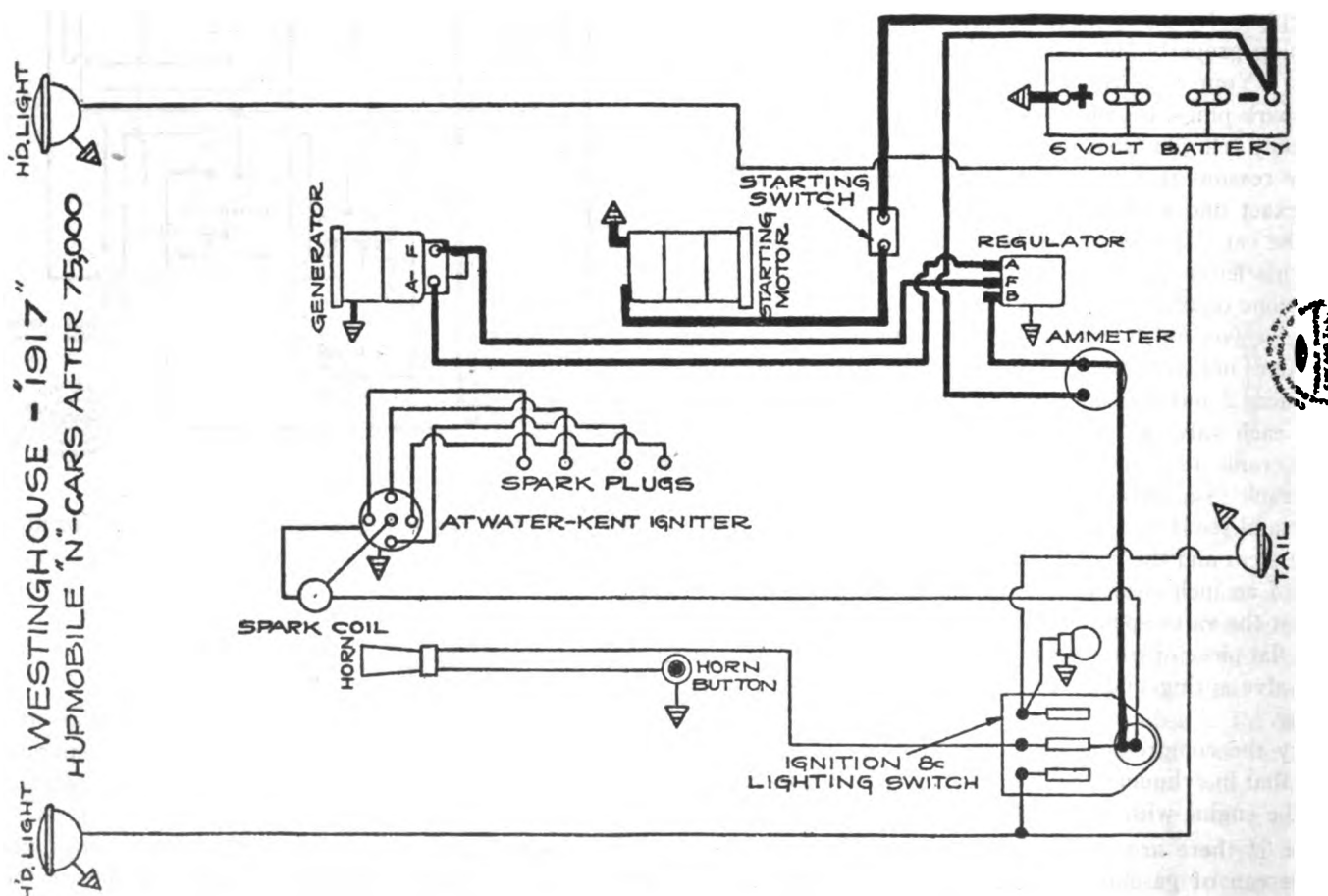
Reply.—The diagram you request is printed at the bottom of this page.

The Knight Type of Engine

3146

From Ralph H. Beaman, Pennsylvania: Will you please give me a short article describing the Knight type of engine? Is this engine any better than other kinds of engines? What are its advantages? Why does this type of engine smoke more than others?

Reply: It is a very difficult matter to reach any satisfactory conclusion as to the relative value of the "Knight" type of engine as compared with poppet valve engines. It would be foolish for us, or for any sane engineer to state that the "Knight" type of engine is either better or worse than the poppet valve engine.



There cannot be any comparison between the two types any more than a comparison of values between four and six cylinder engines.

The "Knight" type of engine has its peculiar traits and advantages—and it has its disadvantages. The writer feels that the choice between a "Knight" engine and an L or I head engine with poppet valves is all a matter of personal opinion, depending upon the man who is investing his money, the amount of money he wishes to invest and what he wants in the way of an automobile.

The "Knight" type of engine differs from other gasoline engines commonly used in its valve construction only. It has the same type of pistons, connecting rods cylinders are approximately the same as other cylinders of the head type insofar as cooling, etc., is concerned.

In the "Knight" engine the piston travels inside a steel sleeve, instead of inside the cylinder as in other engines. This steel sleeve travels inside a second sleeve, and the second sleeve reciprocates inside the cylinder. The two sleeves travel in opposite directions and at their upper ends are fitted with a series of slots.

The slots are so arranged that they register with each other on one side of the cylinder and admit the gas mixture at the proper time as the piston goes downward on its intake stroke. When the piston starts up on its exhaust stroke, the slots in the sleeves register on the other side of the cylinder and permit the escape of the gases which have been consumed.

The movement of the sleeves is controlled by a cam shaft and a connecting rod to each sleeve and is positive both upwards and downwards, no dependence being placed upon springs. Thus the valve action, which is really the sleeve action, is as near noiseless as could be attained.

Since the two sleeves travel in opposite directions and register not only with each other but with ports in the cylinder walls, it is possible to time the engines as far as exhaust and intake are concerned with the utmost nicety. The intake and exhaust ports open in a minimum time, stay open as long as possible and close quickly. On the poppet valve engine the valves are really open but a short time.

On the "Knight" engine the sleeves are so arranged that there is an extremely large area offered for the admittance and escape of gas.

On a poppet valve engine the carbon formation tends to clog the valves and hold them open at times. On the "Knight" engine conditions are quite the reverse for carbon only seals up the openings which might exist between the sleeves and it has been found that a Knight engine runs better, the older it gets, considering ordinary wear and tear.

Unfortunately, however, few mechanics are familiar with the "Knight" engine. Those who do know the engine know that it is a wonderful machine, just as efficient as any engine of the poppet valve type and just as satisfactory in every way, provided it is cared for by some-

one who knows how to make the necessary adjustments and repairs.

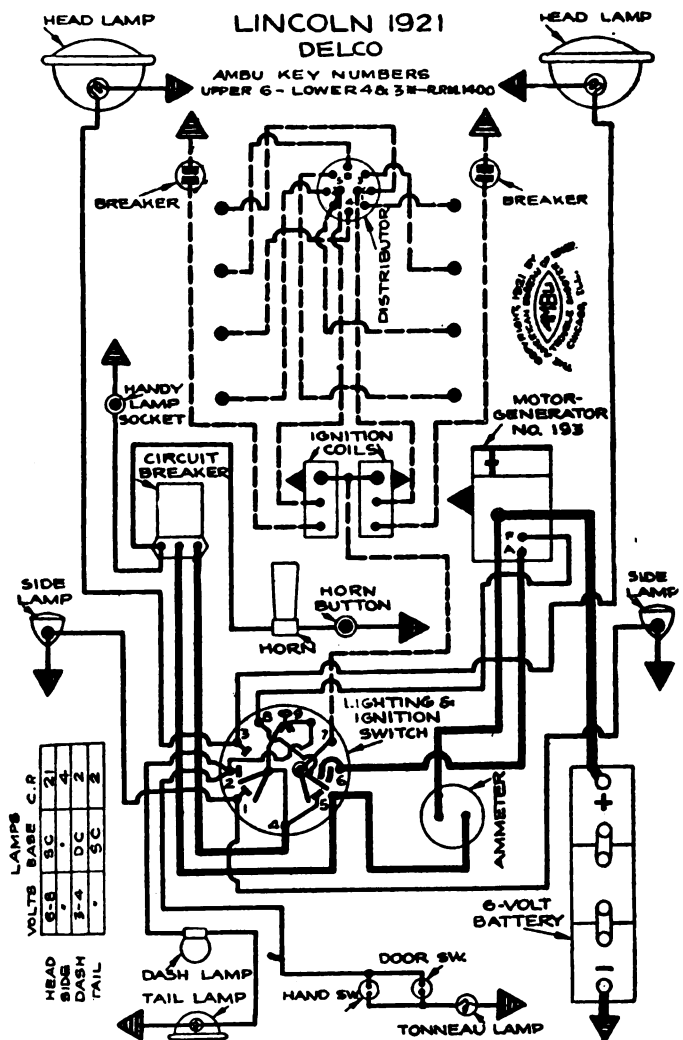
Your last question is a peculiar one. We are not aware of the fact that "Knight" engines are given to the habit of smoking any more than other engines. Insofar as the oiling systems is concerned this engine is no different from others. If an engine smokes it is an indication that there is too much fuel or too much oil in the explosion chamber.

If the smoke is caused by too much fuel, then the remedy is the same as for any engine, cut down on the gasoline adjustment. If the smoke is caused by too much oil it is evident that the oil is leaking past the pistons and the rings should be refitted or new ones installed, same as would be necessary in any engine.

Wiring of Lincoln Car

3147

From Alex. Halladay, Kansas:—I would like to have the wiring diagram for the 1921 Lincoln car, can you furnish me with one? Can I get better illumination from the bulbs if I install a two wire system?



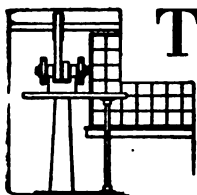
N^o 2438

Reply:—The diagram of the Lincoln car is printed above. You may get better illumination if you replace
 (Continued on page 58)

Storage Battery Charging

The Various Factors Which Influence the Charging Rate and Time Required

By H. A. Mumford



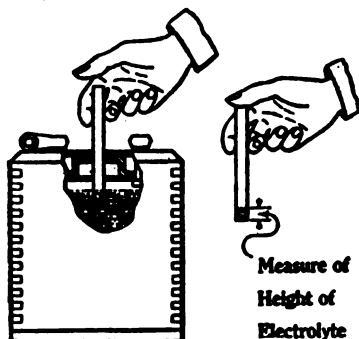
THE matter of battery charging is not entirely clear in the mind of every person who charges storage batteries. At the present time doubtless many hundreds of our readers own battery charging devices, many others would be in a position to charge their own batteries if they

only knew how the work was done.

The reader must not get the opinion that he can repair troubles in a storage battery simply by putting it on a charging current line and letting the current do the work. Charging current, no matter how strong or how weak, will not restore a broken separator or put back the material in a grid which has been destroyed. The owner should know enough about his battery to determine whether it is a subject for the repair man or simply needs recharging.

To a certain extent the storage battery is a delicate unit; but when it is deranged internally the evidences of trouble are so pronounced as to unmistakable as the symptoms of a broken arm. The reader should make it a point to take his battery to an expert just as soon as he notes anything out of the ordinary in its action.

Under normal conditions a battery will be charged on the car even at a low charging rate, but it is a peculiar fact that a battery will in time, gradually lose capacity if it is not given a boosting charge from a high voltage current. The specific gravity of the electrolyte is an excellent indication of the battery charge. Not all batteries, when fully charged, have the same specific gravity.



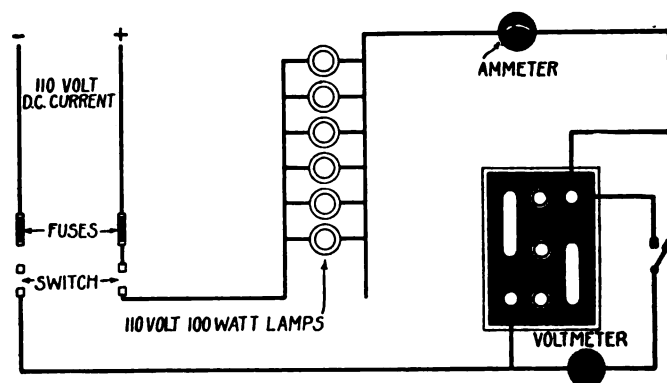
By Dipping a Glass Tube in the Electrolyte, then covering the end and Removing it, you can see Exactly how high the Level is above the plates.

Measure of Height of Electrolyte

Some makers contend that the proper "pep" and "punch" of a battery can only be attained with a strong sulphuric acid electrolyte and they turn out batteries which have a specific gravity of around 1.300. To offset this strong action the plate alloys is made to resist the acid and such a battery will not operate satisfactorily on a low test acid. Other manufacturers so mix the plate alloys that the battery can be operated on an electrolyte of 1.285 sp. gr.

Every car owner should inform himself as to the proper gravity reading of his particular battery. When the gravity falls below this figure, and continues to fall regardless of the charging current, then the battery should be taken to an expert. The car owner is never justified in adding acid, he should add nothing but pure water.

Each cell of the battery is a good check against the others. When one cell goes wrong the specific gravity reading immediately indicates trouble. If all cells have the same specific gravity, then it may be properly as-



Complete Layout for Charging a Battery From Direct Current of 110 Volts.

sumed that the battery is in good condition. At least once each season a battery should be half discharged, at a slow rate, and then recharged again.

Keeping the above simple rules in mind, the car owner is a good check against the others. When one cell goes wrong the specific gravity reading immediately indicates trouble. If all cells have the same specific gravity, then it may be properly assumed that the battery is in good condition. At least once each season a battery should be half discharged, at a slow rate, and then recharged again.

Keeping the above simple rules in mind, the car owner is in a position to know when to take the battery to the service station which is really the main thing to know.

In recharging a healthy battery a source of direct current of from 5 to 10 amperes is necessary. The source may be from the house lighting system direct or through an alternating current rectifier if the lighting current is of that type. Direct current as high as 220-250 volts can be used to advantage, but above that figure, some sort of transformer or reducing device should be used.

Where direct current line voltage of 110 to 250 volts is obtainable a bank of lights such as illustrated in our drawing, or some sort of rheostat must be used as a valve to prevent too much current from passing into the battery. Please note that we have used the expression

"valve," in connection with the light bank or rheostat. If you will think of the resistance as a "valve" you will understand the situation much better.

Suppose, for instance, your battery calls for a 6 ampere charging current, the the "valve" must allow only 6 amperes to pass through it. A light bulb is usually rated in watts and when you wish to know how many amperes will pass through it you need only to divide the number of watts which it will carry by the voltage of the line current. In our illustration you will note that 6 lamps are used, each lamp is rated at 100 watts and the voltage is 110. Dividing the 100 watts by the 110 voltage we find that each lamp is a little "valve" which allows slightly less than one ampere of current to pass through it. Six lamps, connected in parallel as shown, then, will allow slightly less than six amperes to flow into the battery. (Better to figure slightly under the six amperes than above it).

If you wish to increase the charging current it is only necessary to add another light bulb, connected the same as those shown. Remember that a 50 watt light at 110 volts will allow about half an ampere to pass through it. If the current is 250 volts and you are using a 25 watt light, then you will allow 1/10 of an ampere to pass.

If you wish to decrease the charging rate it is only necessary to remove one or more of the bulbs. It will be noted that an ammeter is placed in series with the lights, between the bulbs and the battery. The ammeter is an essential part of the charging apparatus because it may

for making use of alternating current for charging storage batteries, so that we need not go into this matter in this article. Suffice it to say that only direct current, of any voltage up to 250 may be used, either with (if voltage is high) resistance; or without resistance if the voltage is near that of the battery to be charged.

In charging the battery it is first necessary to determine the proper charging current to use. If the battery is in a healthy condition the charging rate should be

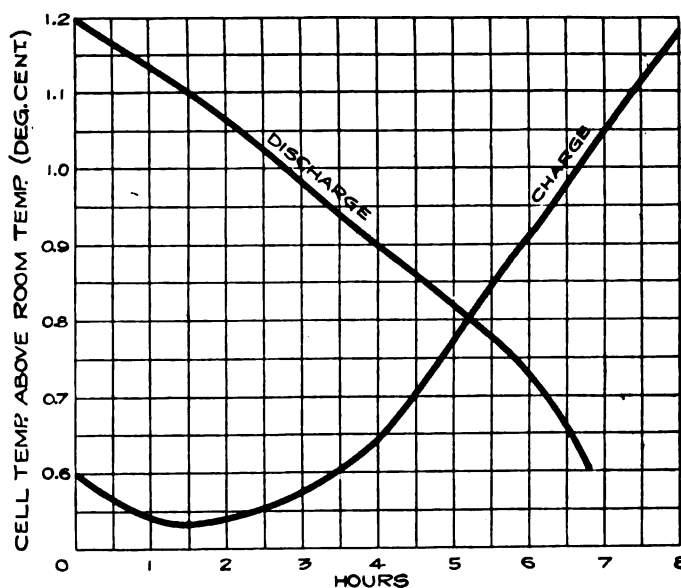


Chart Showing Temperature Changes of Electrolyte During Charge and Discharge. Note That Temperature Given Is Centigrade.

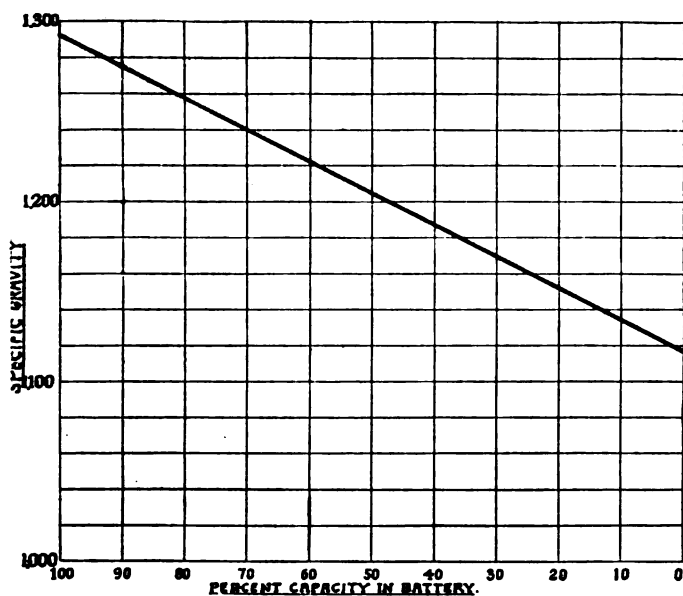


Diagram Showing Relative Charge of Battery Compared with Specific Gravity.

be necessary either to increase or decrease the charging rate.

It is also essential, for best results, to connect a voltmeter around the battery in order to determine the fully charged point. The volt meter should be provided with a switch and connected only for a few seconds at a time as direct later in this article.

In our July issue we describe a charging apparatus

from 1/6 to 1/10 the capacity of the battery. Thus an 80 ampere hour battery may be charged at anywhere from 8 amperes (1/10) to 13 amperes (1/6) per hour. But this high charging rate must not be continued; let us explain further.

At first the battery will absorb considerable current without much of anything happening, but after a time, as the battery becomes more nearly charged to its capacity, either the electrolyte will begin to overheat or the current will decompose the electrolyte and considerable gas will be developed. Should either of these things occur, it will become necessary to lower the charging rate immediately. Hence, a secondary or finishing rate is required. The finishing rate is usually about 1/3 of the first and high charging rate.

The method just outlined that of giving a high, initial charging rate for a time, then dropping down to a lower finishing rate, is termed the "tapering charge" method. It is employed to save time, but if time is no object, then it is practicable to use the finishing rate from the very beginning. The novice is advised to use the lower rate even though it may mean a continuance of the charging current for three times as long as though the heavy current were used.

It is not a difficult matter to figure the time necessary for charging a battery. The hydrometer and the ammeter are the only two units you will need for the purpose.

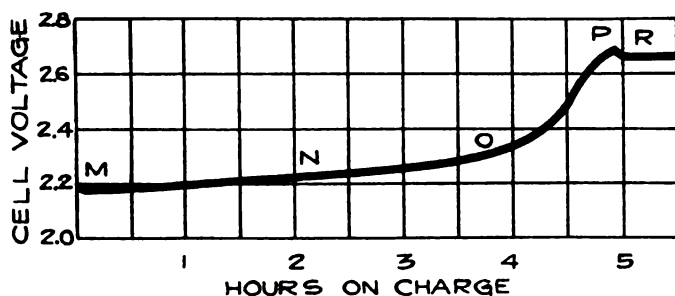
Bear in mind that a fully discharged battery usually

has a specific gravity of 1.150 or sometimes lower, however 1.150 is a good basis to work upon. This statement may be applied to practically every make of lead-sulphuric acid battery. The following table shows two columns of figures. The column at the left applies to a battery which is fully charged at a specific gravity of 1.300, while the column at the right is based upon a fully charged battery at a specific gravity of 1.285.

Specific gravity	condition	specific gravity
1.300	Fully Charged	1.285
1.263	Three-Quarters Full	1.251
1.225	Half Full	1.218
1.189	One-Quarter Full	1.184
1.150	Empty	1.150

Now let us take an example. We have an 80 ampere hour battery which we wish to charge and the hydrometer reading shows a gravity of 1.189. We know that this particular make of battery is fully charged only when the specific gravity is 1.300. Thus we know that the battery in question is only one-quarter full. (See above table.)

Since the battery should carry 80 ampere hours of current and it is only one quarter full, it evidently con



Curve Showing Voltage Rise of Cell During Charge.

tains only 20 ampere hours of current (or less) and it will be necessary to put back 60 ampere hours of current. The proper charging rate, maximum, is 10 amperes and at this rate it would take 6 hours to recharge the battery, were it possible to keep up this high rate.

If the lower, or finishing rate of 3 amperes were used all of the time, it would require 20 hours to recharge the battery. In actual practice it is found that an allowance of 10 per cent is necessary in addition to the theoretical requirement. This if we figure the 20 hours at the 3 ampererate is the requirement we must add 2 more hours to take care of normal waste.

We have considered this side of the matter for one reason only, in order that the reader may figure for himself, in advance, whether it will pay him to recharge his battery under certain conditions or send it to the service station. In the above example, if 110 volt current is used, it will require 60 ampere hours at 110 volts or a total of 6600 watts. Allowing for waste in the battery and lights or rheostat, it will probably require about 7,000 watts. Current in this city costs about \$1.00 a kilowatt, so that in this case it would cost us 70 cents

to recharge the battery which could be recharged at the service station for 75 cents.

In some parts of the country, however, where current costs much less than in New York, it might pay to recharge a fully discharged battery and we leave this matter to the discretion of the reader.

Having determined upon the proper charging rate necessary it is next proper to find which wire to connect with the positive and which with the negative pole of the battery.

With the line current on, dip the two wires into a strong solution of salt and water. When the wires are brought within half an inch of each other, the current will decompose the salt water solution and bubbles will begin to rise to the surface. The negative wire will release hydrogen bubbles. The positive wire will release oxygen bubbles and since there is twice as much hydrogen as oxygen in the water, there will be twice as many bubbles rising from the negative wire as from the positive. Connect the negative line wire with the negative or minus side of the battery.

Before completing the circuit through the battery, remove the vent or filling caps from the tops of the cells in order to permit the escape of the gas which will be generated in the cells during charging. The circuit may then be completed and the battery charged.

During the first few minutes of the charge a careful watch of the battery should be kept and at no time should it be neglected for over one half hour. (Assuming that the high rate of charge is being used.) But if a low rate of charge is being used, then the battery need not be inspected so frequently after it has been on charge for an hour. In order that there can be no mistake in regard to this matter let me explain it in a slightly different way.

When high rate of charge is used watch the battery for the first 15 minutes and then inspect it each half hour thereafter. If there are any abnormal indications, then watch it steadily until things are normal again. When the low rate of charge is used, watch the battery for the first 15 minutes and then each hour thereafter, unless there seems to be trouble. If there is trouble, watch the battery constantly.

Anything out of the ordinary indicates trouble, a sudden rise in temperature, failure of the voltage or gravity to rise, or an abnormal rise in one cell of temperature, voltage or gravity.

Before we can diagnose abnormal symptoms we must know what normal ones are. In order to make a complete explanation, let us consider a battery which is fully discharged to start with. The voltage in such a battery will be about 1.8 per cell, or lower. If the voltage is below 1.8, then conditions are rather serious and the battery should be taken to an experienced man.

As soon as the charging current is put on, chemical action will start and within a few minutes the voltage will rise to about two volts per cell. At the same time the specific gravity will gradually rise and will continue to rise until the cell is fully charged.

Normally, the voltage of each cell will remain at from 2. to 2.4 volts for some hours, then it will begin to rise rapidly to a point between 2.5 to 2.7 volts per cell, an indication that the battery is nearing its capacity. The two things, the cell voltage and the specific gravity must be consistent with each other. Thus when the voltage hops to around 2.5 the hydrometer should show a specific gravity of around 1.275, or higher.

Not only should the voltage for the whole battery be taken and checked against the above figures, but the voltage of each cell should be taken, if possible. It is customary to select a "test cell" for the purpose of checking. This test cell, (for voltage and hydrometer tests) should be the one which shows the lowest voltage and the lowest hydrometer reading.

A normal temperature for the battery is 70 degrees Fahrenheit, but during the charge the temperature is bound to rise somewhat. Any temperature above 100 degrees Fahrenheit is excessive, and the temperature *must not rise* above 105 degrees or the battery will be damaged.

Theory Versus Practice

Theoretically there should be no gassing in the electrolyte until the battery is fully charged, but this does not work out in practice, in all cases. Local action in the plates, air in the water which has been added and other causes result in a few bubbles which will rise lazily from the plates. The bubbles, very small ones, are few in number and much resemble the bubbles which form in water just before it has come to a boil.

But if the gassing is pronounced or can be noted without very careful inspection, something is wrong. The charging rate should be lowered or stopped altogether.

When the cell has become fully charged it will begin to gass freely because the chemical action has ceased and the charging current is expended toward the decomposition of the water in the electrolyte.

In a fully charged cell, then, the specific gravity will be from 1.280 to 1.300 depending upon the maker of battery and will have remained at that figure for at least $\frac{1}{2}$ hour before the charging current has been cut off; the voltage of each cell will be from 2.6 to 2.7; and the electrolyte will be gassing freely.

The gassing of a fully charged cell is a normal occurrence and though it must not be allowed to continue for more than $\frac{3}{4}$ of an hour, it will not work serious damage. But if the gassing is so abnormal as to cause an action resembling the boiling of water, then it should be checked immediately by cutting off the charging current.

Now I have gone into the subject rather deeply in this article and perhaps my readers will feel that the charging of a battery is an extremely difficult and, perhaps, dangerous undertaking. But if you will read this article through several times, you will agree with me that it is not so intricate as it may seem at the first reading.

There are but two dangerous factors involved in the charging batteries, about which I will caution you.

First, remember that hydrogen and oxygen are liberated and that the two gases, free, are mighty forces if they are combined with fire. Therefore do not bring an open flame near to the battery while it is on charge or, in fact, at any time. Secondly; remember that the electrolyte contains a large proportion of sulphuric acid, that it will burn the flesh severely if it is given the chance, and if it should get into your eyes it is very apt to destroy the sight.

For the drawings which accompany this article, in whole or in part, I am indebted to the American Bureau of Engineering, Inc. whose book "The Automobile Storage Battery" should be in the hands of every battery repair man.

EMPLOYMENT SERVICE OF THE FOUR NATIONAL ENGINEERING SOCIETIES

THE Four National Engineering Societies, the offices of which are at No. 29 West 39th St., N. Y. C., probably maintains the best free employment bureau connected with any industry or profession in the United States. Members of many affiliated societies and organizations are available through this service bureau, so that it is in fact a National clearing house for engineering talent of all kinds.

The bureau has advised the "Blacksmith & Wheelwright" that readers who are officials of or connected with organizations in which a central personnel department is not maintained, are at this time given a cordial invitation to make free use of the bureau by advising the various departments in their organizations of the existence and usefulness of the Engineering Societies employment Service.

The bureau is in a position to furnish Mechanical, Designing and Sales Engineers, Superintendents, Purchasing Agents and other Executives.

The administration of the bureau is in charge of Mr. W. V. Brown, Manager, Employment Service, Engineering Societies Building, No. 29 West 39th St., New York City.

American Society of Civil Engineers.

American Institute of Mining Engineers.

American Society of Mechanical Engineers.

American Institute of Electrical Engineers.

Old Mother Goose

(Don't be a back number, get our modern version of Old Mother Goose Rhymes and be miserable. This is a fair sample of what we can do when we really try. Editor.)

This little Ford went to market,

Almost twenty miles from home,

And this little Ford's wasn't greased at all,

Its gears were left alone,

So this little Ford cried, "Squeak, Squeak,
SQUEAK" all the way home.



Spring Lubrication

From E. D. M., Connecticut: Sometime ago I purchased a second-hand Ford car, touring, and because I am somewhat of a mechanic and have little spare cash to pay for repair work, I determined to overhaul the car myself. I made a thorough job of the work and am entirely satisfied except in one particular.

In fixing up the chassis I took off the springs and buffed them until there was not a speck of rust on any of the surfaces. This was a big job because the rust was almost solid on all the leaves and the caked up grease was almost glass hard.

Since I cleaned the springs I have had hardly a week's comfort out of that machine. I can spend two hours on Monday putting grease between the leaves with a thin knife and a string, but by the following Monday the springs will squeak like a nest of crickets and I have the work to do all over again. What can I do to prevent this annoyance?

Reply: As the matter now stands you are up against a stiff proposition. Rusty spring leaves will squeak but they will hold the lubricant; clean, smooth springs won't squeak if properly lubricated, but the lubricant often runs off the steel like water from a duck's back.

Perhaps you are not using the proper lubricant. Try a mixture of flake graphite and oil, of about the consistency of thin molasses. If this does not help matters there is but one thing you can do, install a set of spring covers or spring lubricators.

The writer has been up against this same proposition with a car which had springs of the half-elliptic type. Such was the mounting of the springs and their action that spring lubricators did not seem to be of much help. He tried the following experiment and was entirely satisfied with results.

The springs were first cleaned on the outside with kerosene and a stiff brush which removed practically all of the grit and dust. A piece of thick canvas, khaki color, was cut into strips two inches wide and each strip hemmed the full length on both sides.

These strips were soaked in heavy oil and wound around the springs until these members were covered from end to end. All squeaks stopped and a few drops of oil, poured onto the top of the covered springs, once or twice a month kept the thing quiet.

Although the canvas does not present the finished appearance that a good, leather cover does, it answers the

purpose, keeps the dirt out and the oil in. The ends of the canvas is held in place by strong cord, "half hitched" for about six turns.

Ford Magneto Trouble

From R. E. Woody, Vermont: For the past year I have been bothered constantly by the magneto on my Ford car which fails to give any current at intervals. Upon such occasions I need only to remove the magneto brush and clean it and everything is all right again. But this is somewhat of a bother for it is necessary for me to do this at least once and sometimes twice a week. The brush end seems always to be coated with pieces of lint, where does this stuff come from? I am always careful to put only clean oil in the engine.

Reply: Though your trouble seems to be more pernicious than the average, the cause is easy to determine. In all probability you have at some time installed a set of brake bands, in the transmission, which had a tendency to ravel and fray. The ravelings and lint from these bands are what troubles you now.

There is only one way to really cure the trouble and perhaps prevent the wrecking of your engine. Unquestionably there is a chance that the lint and ravelings will sooner or later clog the oil tube, from the flywheel housing to the timing gears, and should this happen the oiling system will naturally fail.

We would advise you to clean both the transmission and engine, removing all of the old oil, flushing all the parts well with kerosene, allowing them to drain and then refilling with a good grade of lubricant.

To get at the engine, in order to clean it, you will need to remove the oil pan from below. It will also be necessary to inspect the timing gears to be sure that no lint has lodged in that compartment.

The transmission can be cleaned by removing the cover, which also forms the flywheel cover, and flushing that unit with kerosene. Replace the old brake bands with new ones of a reliable make and be just as careful as you know how to remove all dirt, lint and so on from the transmission.

While the cover of the transmission is still off, and the timing gears exposed, run a long, flexible wire through the oiling tube so as to remove all dirt from that unit.

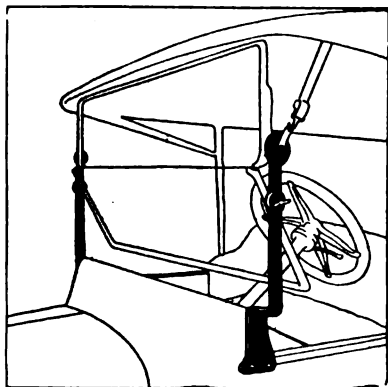
An entire overhaul is best in the end.

Special Ford Accessories

Buckstaff Breeze Brackets

Every Ford owner who has ever perished in the heat from his motor on a hot summer day will welcome the Buckstaff Breeze Bracket. It is said to make possible the opening of the lower windshield so as to direct a stream of air into the Ford's torrid zone. Every motorist knows that half the joy of summer motoring is in the relief from heat. It is said that Breeze Brackets have put complete ventilation within the reach of every Ford owner.

The bracket is a stout, workmanlike job. It fastens to the body in the same way as the standard Ford bracket, even to using the same bolt holes. It requires but a few minutes to install, and is finished in black enamel and does not change the appearance in the least. The windshield hinges in a



slot in the bracket and is made adjustable with wing nuts.

Jobbers and dealers may obtain complete information, prices and discounts by writing the Buckstaff Breeze Bracket Co., 803 "O" St., Lincoln, Nebr.

Three-in-One For Fords

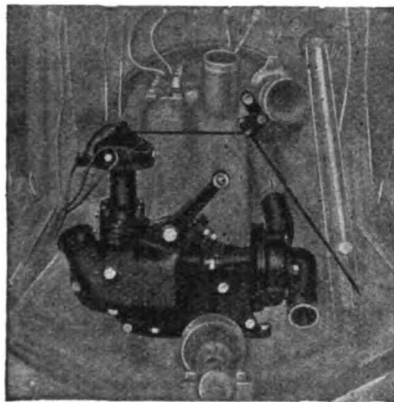
The "Three-in-One" here illustrated, for Fords, Trucks and Fordson Tractors is made by the Hexagon Manufacturing Co., 3630 Grand Ave., St. Louis, Mo. This device combines a timer, an oil pump and water circulating pump, making a wonderful combination for increasing the efficiency and adding to the life of any Ford car, truck or Fordson Tractor.

The Timer which is an oilless-wipe contact timer and is a decided improvement over the Ford timer, is RAISED to avoid inconveniences in getting at the parts, and affords a position for the wiring, eliminating all chances of becoming oil-soaked and attendant ignition trouble.

Perfect combustion prevents carbon and valve grinding. Results in greater mileage.

This oilless-wipe contact timer is replaced with a standard Bosch distributor head, either manual or automatic advance, on the unit with Bosch battery ignition. The Oil Pump is a force-feed type gear pump. A copper tube from oil pump to a special connection at lower pet cock leads oil to front of motor. The combination being in an integral unit makes it possible for the oil pump to discharge the oil through drilled passageways in the casting directly over the gears which drive the unit. This means

that they have positive and proper lubrication at all times, and that their life is that of the car. Consequently this also means that the oiling of the entire unit is automatically taken care of. The oiling system controls and lubricates the parts system-



atically at all speeds, upon all grades and at all times, insuring regulated lubrication free from the danger of clogged pipes, and other faults of the Ford system. The Water Circulating Pump is positive gear-driven, eliminating the necessity of a special belt; avoids the slippage due to a belt drive, making it unnecessary to constantly adjust the belt. The same standard hose connection is used.

This is a great seller for the Ford trade. Write direct to the manufacturer for prices and particulars.

The Toquet Timer Roller For Fords

The mechanical construction of the Toquet Timer Roller for Ford cars will be clearly understood by an examination of the cut shown herewith. This roller is self-lubricating, self-cleaning and gives a positive contact at all times. Some of the advantages claimed for this device are as follows:

Packed in vaseline or other light lubricant, the arc is smothered and burning of



PACK IN LIGHT GREASE

the Timer Shell segments is practically eliminated.

The suspension of the Roller between the hinge and the spring gives twice the Roller pressure for the same spring, and effectively snubs the bouncing.

The flat and groove in the Roller Pin and the Oil holes in the Roller itself guarantee perfect lubrication. Both the roller and its pin are of high quality steel carefully hardened and ground. This gives long life to the TOQUET Roller.

An important feature of the TOQUET Roller is the fact that the axis of the Roller and the Timer shaft are not parallel. The Roller sets at a slight angle to the Timer Shell raceway, giving a rolling and wiping contact.

A practical illustration of this design may be seen in the ROTARY STREET CLEANING SWEEPER. In this case the brush suspended from a frame at a slight angle effectively sweeps a path the entire width of the brush, and throws the debris to one side.

This is why the TOQUET ROLLER cleans the contacts, keeping them bright and smooth. Always insuring a perfect contact.

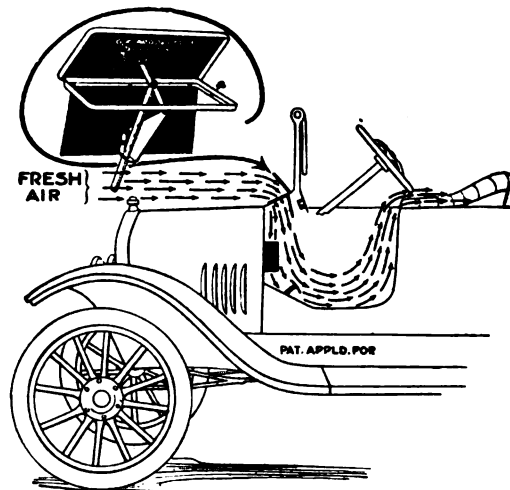
This is why it will smooth up an old Timer Shell and make it again useful.

The TOQUET ROLLER can be used with any standard make of Timer Shell. It will outlast a dozen shells and save you much time and inconvenience.

Any old timer shell will time every time and all the time with the TOQUET ROLLER. This device is made by the Reliance Automotive Devices Inc., 243 West 55th St., N. Y. City.

O. K. Ventilators

We illustrate the O. K. Ventilator a new device for Ford and other cars. It is scientifically designed, so as to direct the cooling air to the bottom of the car, where the heat is enveloped under the cowl, doing



away with that hot, burning sensation which makes life miserable when driving in summer time or in warm winter days. A semi-hardening cement is used to make this ventilator waterproof thereby eliminating gaskets, which eventually leak. The ventilator is simple and easy of adjustment, locks in all positions and cannot rattle. This device is manufactured by R. D. Boyd Corporation, 2660 Washington Ave., St. Louis, Mo.

A New Goodrich Tire

One of the latest additions to the tire family is the new Goodrich "55" clincher tire made in 30 x 3 and 30 x 3½ inch sizes. The appearance of the tire, as a whole, is excellent, it has a rugged, non-skid tread design with full size cross-section dimensions.

New and Useful Automobile Accessories

A Novel Window Display

The Metal Stamping Co. of Long Island City, manufacturers of Lym Bumpers are placing at the disposal of dealers a novel and attractive window display, which may

all these parts being eliminated. In spite of the absence of springs the "LITTLE GIANT" wrench takes hold and releases instantly at the option of the user.

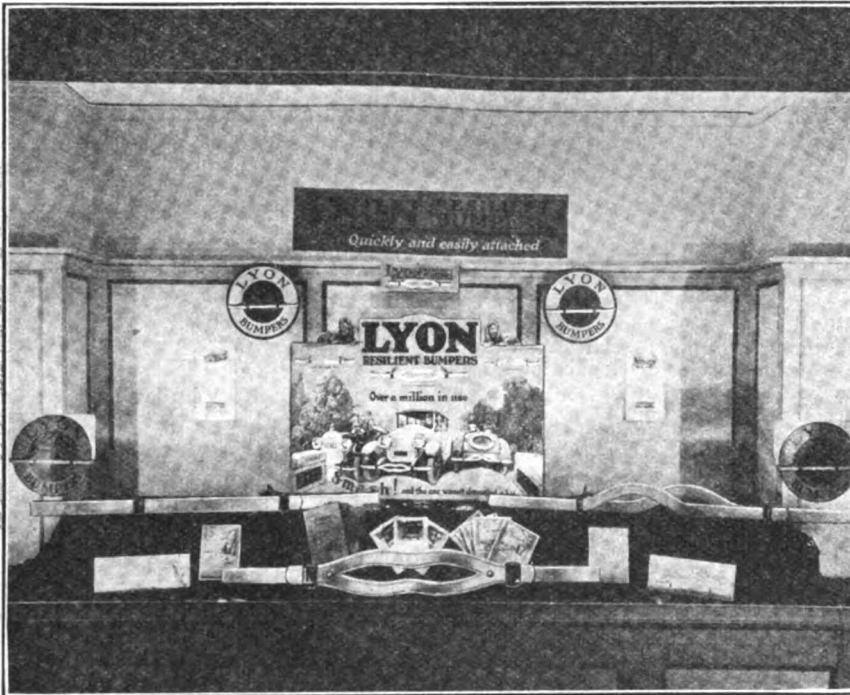
The new wrench has been designed for maximum strength. The 14" size has re-

Another feature is the double set of teeth on the main jaw. The movable jaw can be engaged at the option of the operator with either of these sets of teeth with consequent lengthened life. On the large sizes, 14" and greater, two additional sets of teeth are provided, making four in all, and the movable jaw can be reversed to engage these additional sets of teeth, which are below the adjusting nut. This is very useful in connection with certain classes of work, besides practically quadrupling the life of the tool.

The "LITTLE GIANT" wrench is being manufactured in 8, 10, 14, 18, and 24" sizes, of which the three smaller sizes are already on the market.

A point of particular interest to dealers is the bright orange paint with which the panels in the handles are covered. Wholesalers and retailers appreciate the attractiveness of color, and this feature will aid in arousing consumer interest in the "LITTLE GIANT" wrench.

The new wrench is a product of the Greenfield Tap & Die Corporation, Greenfield, Mass., "LITTLE GIANT" is one of their trade marks, well known throughout the trade to all users of Screw Plates, Taps and Dies. The new wrench will be extensively advertised by its manufacturers.



be partially appreciated by glancing at the accompanying illustration.

Realizing that accessory sales are heaviest during the Spring and Summer, but that the need of bumpers is particularly great during the period of icy streets, this company is putting out its display at a time when it will tend to increase fall and winter sales. The lithographs are furnished free to all Lym Bumper Dealers.

peatedly withstood stresses in excess of 4700 inch pounds without slipping or bending. Readers familiar with government requirements will recall that the army and navy departments require a test of 2800 inch pounds for a wrench of this size. Yet

"Little Giant" Pipe Wrench Presented To the Trade

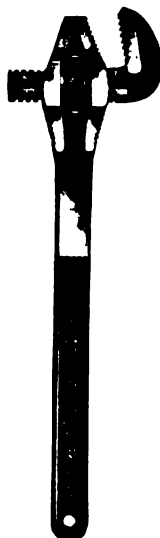
The "LITTLE GIANT" Pipe wrench, a new wrench with several interesting improvements has just been put on the market. The "LITTLE GIANT" wrench has the "end opening" feature which is familiar to users of machinists' wrenches. Its application to pipe turning can readily be seen by a glance at the accompanying picture.

The advantage of the "LITTLE GIANT" wrench over the conventional style is the ease with which it can handle pipes in corners, close to walls, and similar confined places.

The person using it can set it straight on the pipe as he would a pair of pliers, instead of having to fit the jaws on from the side.

The "LITTLE GIANT" wrench has only three parts; a handle and jaw in one piece, which is drop forged and heat treated; a movable jaw, likewise drop forged and heat treated and a hardened steel nut. There are no springs, rivets, frame or pins,

owing to the elimination of extra parts the "LITTLE GIANT," in spite of its extra strength weighs less than a Stillson type wrench of corresponding capacity. This is an advantage to users and dealers alike.



Townplates Are The Thing

Nearly all motorists in these days desire to exploit their home towns by attaching a neat townplate above or beneath the regular license plate. The Larson Tool and Stamping Co. of Attleboro, Mass., is making a specialty of these townplates, and they can furnish the name of any city or town in the country. These new TOWNPLATES are made of No. 26 gauge embossed steel, size about 2" by 10" and enameled to correspond with the colors on any state license plate.

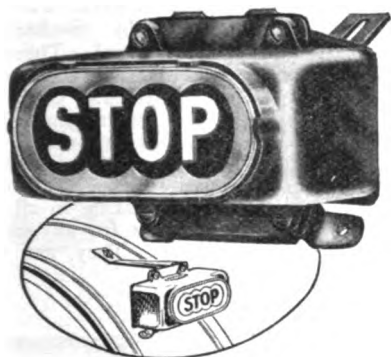
They are firmly and permanently attached to either the top or bottom of any state automobile license plate by the use of the "License-Clip" fasteners, which are furnished with the TOWNPLATES.



The Ensign Stop Signal

The "Ensign" is a novel automatic stop signal device which has been placed on the market by Spengler-Loomis Manufacturing Co., 58 East Washington St., Chicago, Ill.

The instant the car slows, The ENSIGN flashes. It works as though nature had made special laws for it. When going up-hill, the light is off, but goes on instantly, the moment the brake is applied. Going down-hill, the element does not roll into place to cause an electrical contact, unless there is an actual arresting of momentum by brake pressure. Over bumps, there is no flash of the signal, because the force is an up and down movement, instead of a backward and forward movement. If the bumps are severe enough to cause an actual arresting of momentum, the signal will flash the same as under any other conditions where the momentum is arrested. In all instances, the signal flashes off again instantly, the moment there is no further need for it.



In other words, The ENSIGN is thoroughly efficient as a signaling device. Its action is absolutely automatic, and is governed entirely by the action of the car itself. The signal always flashes when there is an actual need for it. It never flashes unless there is a need for it. In every case it flashes off again, the instant there is no further need. There is nothing about it to get out of order, unless it is the bulb. That is something nobody can control.

Many readers will wish to investigate by writing for particulars to the manufacturers. When you write mention this publication.

A Headlight Controller That Dims Lamps Gradually

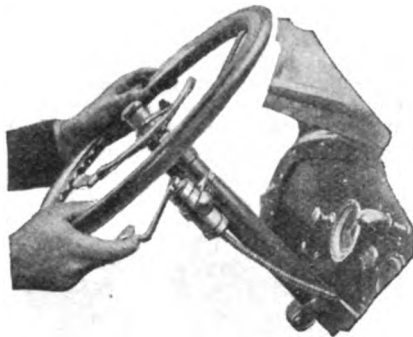
Every car owner will welcome the Universal Headlight Controller, which takes the peril from night driving by gradually dimming the headlights. This device eliminates the danger of abrupt dimming, which always plunges the road into complete darkness while the eyes are adjusting themselves to the sudden change.

The Controller can be installed on any steering-post in a few minutes and is so located that the controlling lever is operated by a gentle pressure of the finger without removing the hand from the steering wheel. To dim the lights the driver simply pushes the lever forward. The further he pushes it the dimmer the lights become.

There is no sudden change from brilliant to dull, for the lights simply melt down to whatever degree of intensity the driver desires, to a pinpoint, if he wants it. As a result the road is never lost to view through a rude shock to the eyes. The driver is not annoyed by reaching over the wheel to the dashboard for his operation.

The wiring attachment is simple, for one control wire it attached to the switch, the

other to the bright headlight wire, which has previously been disconnected. The Controller and wire conduit are nickel plated and polished and will last for the life of the car without any attention. It has only one moving part and requires no service.



The Controller is manufactured by the Universal Headlight Controller Co., Fisk Building, New York, N. Y. The list price is \$7.50 complete ready to install.

The E. A. Electric Wind Shield Cleaner

This cleaner is novel in construction. It is very simple to install and when mounted does not affect driver's vision. Requires a minimum of current consumption and does not interfere with the electrical equipment whatever. Neither will it affect the efficiency of batteries or motor. When not operating it is entirely disconnected from the electrical equipment by means of a convenient cut-out switch, thus eliminating



every possible chance of waste in current consumption.

This device is sold with a very strong guarantee. The cleaner is reasonable in price and is a great seller for any dealer to handle. For prices and particulars write to the manufacturers, the E. A. Laboratories Inc., Brooklyn, N. Y., not forgetting to mention this magazine.

The Lubricator

This is a small but carefully designed device, herewith illustrated, that gives absolute protection it is claimed against burnt-out bearings and scored cylinders. It also prevents gasoline leakage and the possibility of disastrous fires.

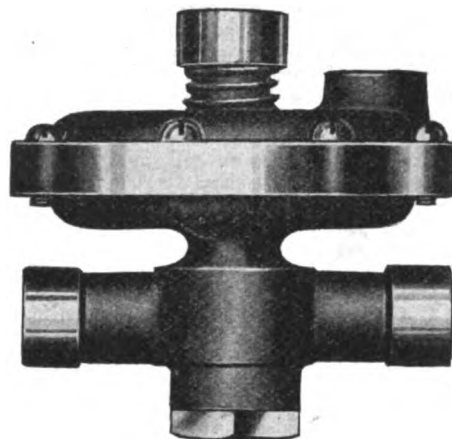
As shown in the illustration, the Lubri-Tector is installed as close to the carburetor as possible. The oil line is cut, a tee inserted, and the line from the tee connected to the opening in the top of the device.

Just as long as the engine is running and

the lubricating system functioning properly, the oil pressure exerted against the diaphragm of the Lubri-Tector will keep the valve in the gasoline wide open. But let the oil supply run low or the pump fail, the oil pressure ceases and the gasoline valve closes immediately, stopping the engine until the trouble is remedied. It is far cheaper to prevent damaged bearings and cylinders than to repair them.

And when the engine is voluntarily stopped by the driver, the valve in the gasoline line automatically closes until the engine is started again, preventing gasoline leakage.

This device is manufactured by the Pierce Governor Co., Andersen, Ind., to whom all inquiries should be addressed.



Business Analysis of United States Made By Counties

With students of business conditions universally agreeing that the business tide has turned, and that success in the future will come to those who plan carefully now, the subject of the following review by Mr. Willford I. King of National Bureau of Economic Research, Inc., 474 W. 24th Street, New York City, is particularly interesting and timely.

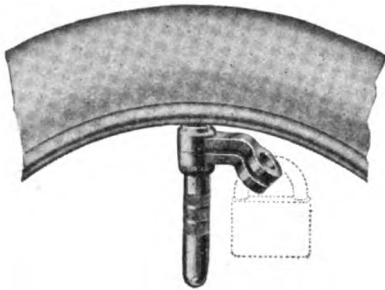
"The Wm. H. Rankin Company has recently compiled a handy book giving important statistical facts of interest to business men. The report shows for each county in the United States the respective values of farms, of crops and of manufactures, the white population of the county, the number of automobiles registered, and the mileage of all roads. The figures for surfaced roads are also recorded separately. All of the preceding figures are taken from the latest available official statistics. An estimate has also been made of the total income tax paid by the people of each county. The summary for each state includes in addition to the items given for counties a record of the chief facts concerning the climate.

"Each volume consists of a flexible leather binder containing loose leaves which can be replaced as later information becomes available. Expense has not been spared in making the books attractive and convenient.

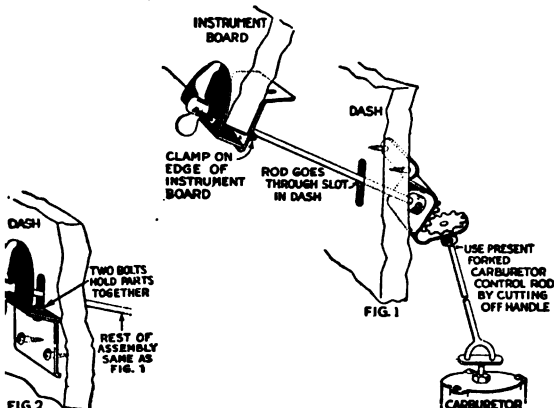
"It is easy to see that this work will prove a great convenience to business men who are interested in selling campaigns. It gives them in two volumes the information which would otherwise have to be dug out of a whole shelf full of government reports and the compact form of presentation greatly facilitates reference and comparison."

Two New Imperial Specialties

The Imperial Brass Manufacturing Co., 1200 West Harrison St., Chicago, is constantly bringing out new and useful automobile specialties. The Imperial Spare Tire Lock is one of their latest productions.



This device locks the spare tire in its carrier making it thief proof, nor can anyone let out the air by tampering with the tire. The Imperial Carburetor Control for Fords has also made a hit. It eliminates guess-



work! Its dial on the instrument board shows just where the needle is set, indicating the mixture best suited for the car. And it's so convenient—the driver adjusts it at any time without ever changing his driving position! The cut shows just how this device is installed and used. Here are two great sellers for any accessory dealer.

An "Instant-Positive" Adjustable End Wrench

A nation-wide demand for an end wrench that will **ADJUST INSTANTLY** and **STAY ADJUSTED** until the nut is loosened or tightened is at last satisfied in **THE GELLMAN**.

The wrench is drop forged of the highest grade steel, which allows a carbonized hardening process that will enable one to use the wrench under several hundreds of pounds of pressure. Indeed a Herculean tool, yet light in weight and thin enough to work in cramped places.

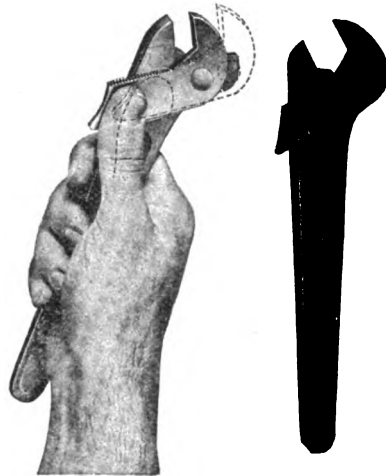
The screw is eliminated from this wrench, which at the same time eliminates bulkiness in the head. By the illustration, it will be noted that the handle member forms the lower jaw and is notched at right angles to the gripping face, while the movable upper jaw is also notched and can be moved up or down when the notches are pulled out of engagement. Simply by pressing with the thumb (of the hand holding the wrench) on the corrugated part of the movable jaw and disengaging, the upper jaw will move instantly up or down, without any friction, to the adjustment desired. The wrench can be used in any direction

desired. There are no parts to get out of order.

Manufactured in sizes of 6, 9 and 12 inches. Each weighing 4, 10 and 20 ounces, respectively. The 6 inch will do for light work, while the man doing heavier work, will find the 9 and 12 inch wrenches built for "duty" and at the same time able to take large nuts down to real small ones.

"No posts, screws or threads, its all wrench."

Jobbers and dealers are urged to write for a sample and for the popular trade proposition made to dealers. The wrench is made by the Gellman Wrench Corp., Chamber of Commerce Building, Chicago, Ill.



Bearings Service Company Dissolves

The Bearings Service company as an active organization will be dissolved December 31, 1922, according to Alfred K. Hebner, president and general manager.

The Bearings Service company was incorporated June 26, 1916, and will have completed by December 31, 1922, six and one half years of existence, being the concern acting through 32 direct branches and approximately 1000 distributors as the service department of The Timken Roller Bearing company, the Hyatt Roller Bearing company and The New Departure Manufacturing company for the service distribution of Timken, Hyatt and New Departure bearings.

On and after October 1, 1922, the servicing of Hyatt and New Departure bearings, the manufacturers of which are units of the General Motors Corporation, will be handled by the United Motors Service, Inc., and a new company to be known as The Timken Roller Bearing Sales & Service company will care for the servicing of Timken bearings.

"Until January 1, 1923, when The Timken Roller Bearing Sales & Service company will be in operation, the Bearings Service company will continue the servicing of Timken bearings as heretofore at all its 32 direct Branches located in the principal cities throughout the country.

"In addition in any of these cities where the United Motors Service, Inc., does not have branches the Bearings Service company's branches up to January 1, 1923, will sell for service Hyatt and New Departure bearings.

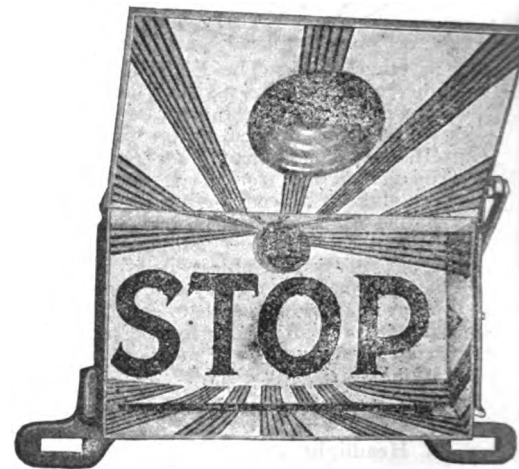
To indicate the continued mutually friendly attitude in service affairs between the manufacturers of Timken, Hyatt and New Departure bearings, the United Motors Service, Inc., will appoint as service dis-

tributors of Hyatt and New Departure bearings, the direct branches of The Timken Roller Bearing Sales & Service company in cities where the United Motors Service, Inc., has no direct branches and conversely The Timken Roller Bearing Sales & Service company will appoint direct branches of the United Motors Service Inc., as its service distributors for Timken bearings in such cases.

These arrangements will result in the public obtaining just as good if not better, service on all these three bearing lines, Hyatt, Timken and New Departure, than has been available in the past through the Bearings Service company."

The Sunbeam Warning Signal

The illustrations show this signal open and closed. This is a mechanical warning signal operated entirely by mechanical means. It is a real stop signal. There is no chance for it to become confused with the tail light. The **SUNBEAM** signal is on the inside of its case, so it cannot become obscured by mud, dust or snow, or by the direct rays of the sun. And its peculiar arrangement of design—the word "stop" with red and white beams flaring in all directions—makes it impossible for anyone in the rear to overlook it. They get the



SUNBEAM OPEN

warning instantly, and in such a strong positive way, that they must act upon it.

This excellent device is made by the M & M Auto Products Co., Rock Island, Ill. In writing them mention this magazine.



SUNBEAM CLOSED

The Sta-Rite Connecting Rod Bolt

You can install Sta-Rite connecting rod bolts without taking out the motor. They require no tools to install—all finger work. You can install them with one hand. The special locking device is the great feature. With this device it is impossible to insert cotter-pin until you have turned the lock washer one turn to right to lock No. 1 which gives spring correct circular tension and automatically sets lock washer in correct position to insert cotter pin lock No. 2. This device makes "Sta-Rite" bolts fool-proof. Local agents are wanted, but good territory is going fast. Write now to The Sta-Rite Co., 711 Harrison St., Davenport, Iowa.

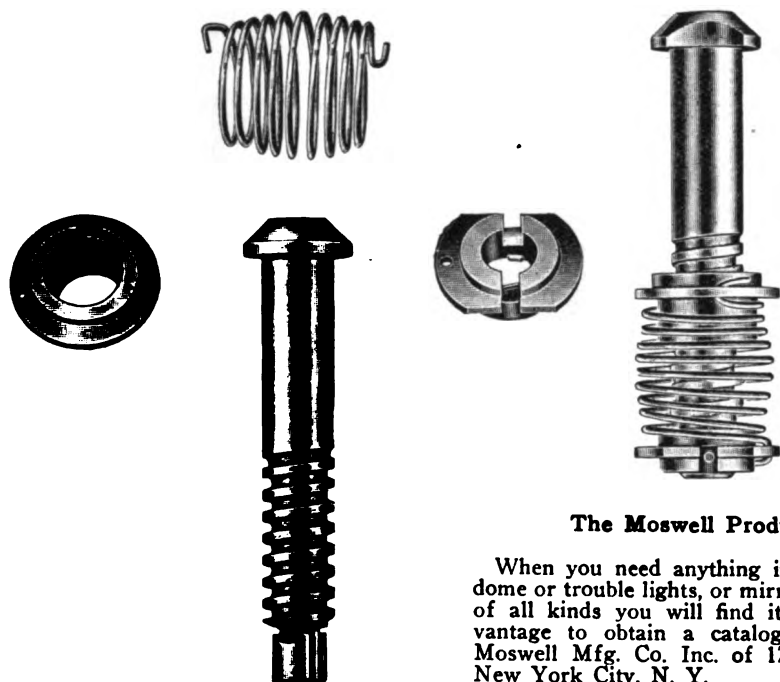
It also indicates right and left turns in red, and when a car is brought to a standstill, serves as a parking lamp. The big feature of this signal, however, is its green running light. It is unmistakable in its significance and cannot be confused with lights on railroad crossing gates, highway construction obstructions marked by red lanterns, etc. By its use "red" can be re-established so that it will occupy its former place of "danger signifying" pre-eminence.

This signal appears to be designed along the right lines and is certainly a great step in advance over the heterogeneous conglomeration of signals which has flooded the market during the past two or three years. Its inventor deserves the moral support of the motoring public.

More Than Five Million in Two Months

The fact that The Piston Ring Company of Muskegon, Michigan, has only been going after replacement business for less than a year, attaches special significance to the recent production record of 5,232,051 QUALITY Piston Rings during two consecutive working months.

Although the Piston Ring plant has a capacity of 12,000 rings per working hour, there is every reason to believe that further expansion will soon be necessary to keep abreast of the ever-increasing demand for QUALITY Piston Rings.



The Moswell Products

When you need anything in the way of dome or trouble lights, or mirrors and vases of all kinds you will find it to your advantage to obtain a catalogue from the Moswell Mfg. Co. Inc. of 175 Grand St., New York City, N. Y.

This concern makes a mirror for every kind of car and of every standard type. Mirrors for attachment to windshields or fenders and reflectors for the inside of closed cars. There is a clamp made for every type of mirror so that any of the mirrors may be adjusted to face in the proper direction as well as to clamp upon round, oval or square windshields.

One of the specialties made by the Mos-



well Mfg. Co. is illustrated herewith, a flower vase for closed cars. The vase is artistic and neat with a cut glass design and is clamped to the car by means of a nickel plated brass bracket. The vase is seven inches in length. This company also makes a "non-splash" flower vase.

A Life Saving Device For Closed Cars In Rain, Fog, or Snow

One of the most lamentable features of automobiling is the fact that seemingly, in spite of the ingenuity of man in the past, it has been impossible to drive with safety through rain, fog, snow or dust, due to the fact that no adequate means has been found to give the driver clear vision through the windshield. This applies especially to closed cars in which the family are usually found.

In looking over the claims settled by some of the largest and best known casualty insurance companies, the inventor of the world-wide known Dictograph was astounded at the accidents caused by drivers attempting to "get by" with a windshield befogged and wet.

The outcome of this investigation, entered into largely as a matter of curiosity, was the invention of the Clearview Windshield Cleaner, which cleans with one stroke both the upper and lower glasses of the windshield.

The cut shows just how the "Clearview" is used. It is made by the Yale Corporation, Suite 603-608, I. W. Hellman Building, Los Angeles, California, to whom all inquiries should be addressed.



A Most Convenient Catalog

We have received from Foster, Merriam & Co., Meriden, Conn., manufacturers of the Bear Tite Piston Rings, a copy of their new 1922 catalog which contains a complete table showing number of cylinders rings per piston and sizes of rings required for all makes of cars. The catalog also contains other information for any repair man who installs piston rings. It is a valuable book of reference and should be in the hands of every repair man. It will be sent free to any in the trade who will write for it and mention this magazine.

A New Automobile Signal

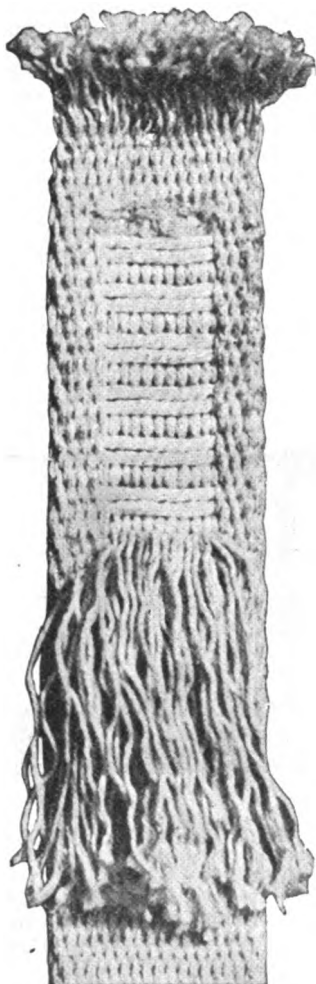
During the past year or so a great deal of serious discussion has been carried on by such august bodies as the American Engineering Standards Committee, Illuminating Engineering Society, International Traffic Officers' Association, the Signal Section of the American Railway Association, etc., in the hope of arriving at some definite conclusion in regard to standardization of traffic signals.

It is a generally recognized truth—and a disastrous one—that "red," in so far as signaling is concerned, has practically lost its significance. There was a time not so long ago when a red light spelled "danger." But today, with over ten million motor vehicles operating on our public highways, each displaying a red tail light, this signal has become so common that its "danger" significance has been all but lost.

It has remained for an individual—Paul A. Stover, of Racine, Wis.—to formulate a solution and pioneer its introduction to the motoring public of America. This young man has perfected an automobile signal which combines such features as a green running light to indicate "clear road ahead" (used by railroads the world over), and a red light which is automatically flashed on in place of the green light when the brake is applied or the clutch released, warning traffic behind of "danger ahead."

Special Construction of White Stripe Transmission Lining

Careful examination of a strip of White Stripe Transmission Lining for Fords, manufactured by the Advance Automobile Accessories Corp., 1721 Prairie Ave., Chicago, reveals why this super lining gives such unusual service. The makers of White Stripe secured an idea from the tire manufacturers. They protect the tire fabric from grinding by a tread of rubber. Why not protect brake lining in the same way? And it was done. The framework threads of White Stripe are protected in the same manner—by an extra service layer of heavy hose cord yarn. White Stripe weave has been famous for years. It's clearly shown in the illustration, and necessitates a battery of specially built looms to supply the ever increasing demand for this quality lining. In the photograph the heavy layer of hose cord is cut away and ravelled to show the powerful framework—the 21 ply cross cords and the strong lengthwise binder. White Stripe is the only fabric that has 21 ply cross cords. In ordinary fabric the framework threads are exposed to surface wear. After a little wear they tend to ravel and come to pieces. But this is impossible with White Stripe. The hose cord yarn—the tread—protects the framework from all wear. It will wear to the last thread. White Stripe never gets thin. The manufacturers overcame all packing down ten-



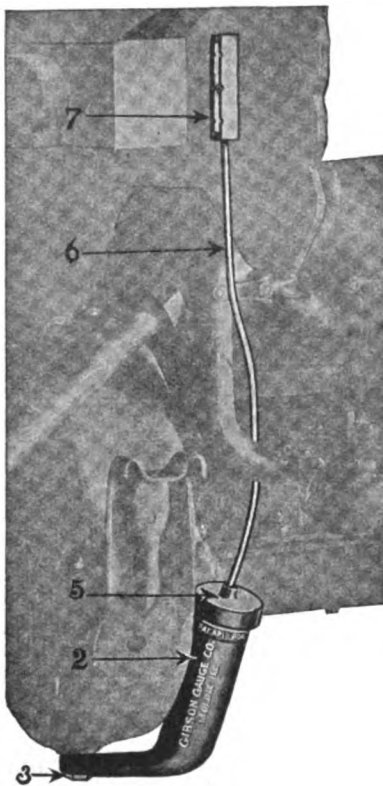
dency by putting in more long fibre cotton yarn than was ever put in a Ford lining. Every foot contains 20 per cent to 50 per cent more yarn than any other lining. A special tallow oil treatment was developed to keep the lining soft and pliable.

It is literally boiled into every fibre. Under heat it comes to the surface and prevents carbon from being deposited on the surface of the lining. That's why it never glazes, never gets "Slick." The quality of long fibre yarn, the special weave and treatment combine to make White Stripe most favorably known from coast to coast. It is packed in individual containers; twelve to a two colored display carton for the dealer's window or counter.

The Gibson Oil Gauge

We illustrate a special oil gauge for Ford cars, made by the Gibson Gauge Co. 2304 Seventh Avenue, Moline, Ill.

The arrangement of the Gauge is new. The basic thought is that the float should



be as near the center vertical plane of the engine as possible while the indicator proper should be comfortably visible without any effort upon approaching the car or while in the seat. These fundamentals resulted in development of the flexible connection between the float at the engine base and the indicator on the dash.

A float type of gauge is reliable because it operates by the change of level of the oil directly to the indicator. Air and electricity, used to convey the information from the actual oil level to an indicator, have peculiar actions of their own, due either to their character or source; for instance, change of temperature causes independent variations of the indication, etc.

A float or any other type of gauge, which necessitates an action by the driver, such as lifting the hood, possibly cleaning gauge, etc., fails of its object, for while furnishing a gauge, why not make it 100% desirable, even to avoiding the job of lifting the hood or unscrewing, pulling out and reinserting an oily dip stick.

G O G is visible as the driver enters the car or while in the seat. It is a continuously comfortable assurance or warning, involving no conscious effort on the driver's part and it surmounts all the difficulties of construction and arrangement of a float type dash gauge.

The Colestock Timer

Every Ford owner can protect himself against timer trouble, it is claimed by installing a Colestock Timer.

The big thing about the COLESTOCK TIMER is the knife switch contact providing large contact surface through its flat sided disc wheel distributor. There is no fibre to wear or warp and cause mis-firing. The insulation is by air—perfect and lasting. Pack hardened wearing surfaces insure long trouble-free service. Double disc distributor construction eliminates the possibility of spring trouble. Last, but not least,—there are only two moving parts to this timer, which works perfectly, even at a sixty-mile-per-hour test.

This is the Timer you pack with grease which relieves you of that dirty job of cleaning and oiling your timer several times a week in order to get service.

A good, sturdy timer at a popular price. Retail price \$2.00 each. West of the Rockies \$2.25.

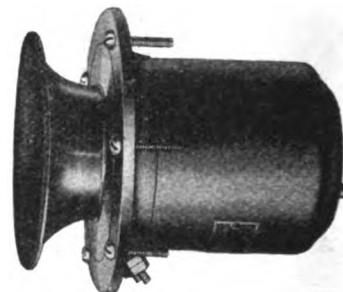
You want satisfactory timer service, therefore, the next time you buy one, purchase a Colestock. Attractive discounts to dealers. This Timer is made by the Colestock Mfg. Co., Chicago, Ill.

New Klaxon for "Cadillac 61"

The Klaxon Company has brought out a new model—the Klaxon 16—an electrical motor driven horn especially designed for use on the "Cadillac 61."

The instrument is mounted on the cylinder block directly in back of the fan by means of two large cap screws.

The design of the new Klaxon is unique in many respects. The adjustment is made absolutely rigid by two adjusting lock nuts



on either side of the motor. No amount of jarring will shake the parts loose. At the same time should wear have to be taken up—after years of use—readjustment can be accomplished by a simple turn of the lock nuts.

The shaft of the motor armature revolves on ball bearings at both ends. The motor starts instantly when the current is turned on.

Lubrication is needed rarely, a few drops of oil on the ball bearings every 2,000 miles being sufficient. The brushes are entirely self lubricating and unusually long springs assure their even pressure in the commutator.

The instrument can be cleaned with little trouble—all vital parts being uncovered when the back shell is removed.

The note of this new Klaxon is high pitched—powerful and unusually penetrating.

Greb Rear Axle Press

The Greb Rear Axle Press, which is manufactured by the Greb Company, 197 State Street, Boston 9, Mass., is designed for removing axle and drive shaft gears and pressing on axle gears. This Raer

Axle Press No. 12 has a capacity of shafts up to one and one-quarter inches and gears up to six and one-half inches.

Fur Lined Overcoats

The time is rapidly approaching when the cold blasts of winter with its driving snow and sleet will make you wish that you had purchased that good warm fur lined overcoat with the large fur collar to turn well up around your neck to keep out the elements.

On page 19 of this issue E. Hart, Manufacturing Furrier offers you the opportu-



ity to secure just the garment you will need, a handsome black kersey cloth overcoat lined and collared with fur at one half the retail price, fully guaranteed as to quality and workmanship. You can order this coat forwarded to you for your inspection. You need not pay for it until after you have examined it thoroughly and found it entirely to your satisfaction and more than up to your expectation.

Seventeen years of selling direct to the consumer has enabled this concern to eliminate all middlemen profits as a result of which you get the benefits. Don't wait until the winter arrives with the possibility of an advance in price, but send in your order now. See advertisement on another page of this magazine.

Nathan Radiator Covers

Automobile accessory dealers throughout the country have acquired a favorable opinion of the large line of automobile specialties manufactured by the Nathan Novelty Mfg. Company, 55 Fifth Ave., New York City.

This new "Spring Shutter" Radiator Cover which has just been placed on the market by this enterprising manufacturer, is adjustable from the dashboard. A touch of the chain and the dash adjusts the Nathan Spring Shutter exactly as you want it, and you can readjust it just as often as you need to without moving from the driver's seat.

The great convenience of such a device for Winter driving is too obvious to need any detailed explanation. It is generally agreed that no car should be operated in cold weather without some protection for the radiator, and this new radiator cover combines every point of excellence that inventive genius has been able to discover in an article of this kind.

The Nathan Radiator Cover is guaranteed as to material and workmanship and if any part should show a defect, same will be replaced free of charge if the faulty part is sent to the Company with full particulars as to the defect. This radiator cover is reasonable in price and should be stocked by every live dealer in automobile accessories.

Write for prices and particulars direct to NATHAN NOVELTY MANUFACTURING CO., 55 Fifth Ave., New York City.

A Krauter Battery Plier

A new plier, designed for handling storage battery cells and plates, has been placed on the market by Krauter & Co. Inc., of Newark, N. J.

This tool bears some resemblance to a webbing or auto fabric plier, which battery men have been using for want of a better tool.

The jaws of this new plier are two inches wide in order to distribute the pressure over a large area, and thus minimize danger of breaking or distorting the walls of the battery cells to be removed. Deep corrugations are cut across the gripping surfaces to prevent slipping.

One of the handles is hooked at the end, so that a lifting force may be applied without excessive pressure on the handles.

The plier is made of aluminum bronze forgings, tempered by a process recently perfected at the Krauter plant. This material resists the action of acid exceptionally well.



No Excuse for Cold Garages

You would not throw your winter wood in the river, or dump your coal pile into the bay, yet Lloyd D. Collar, proprietor of the Union Street Garage at Alameda, California, has made the astounding discovery that garage men all over the country have been pouring down the sewer, for many years, hundreds of barrels of good fuel oil. He has proven conclusively that the refuse oil from motor cars can be used as a fuel and every garage doing even a moderate business has been throwing away fuel enough to heat their garage and homes and furnish steam for all of its many uses around the garage.

Mr. Collar has been working for a number of years on an Oil Burning System designed to burn any grade of fuel oil without the aid of electric motors, air compressors or any mechanical devices; and a few months ago succeeded in getting the System perfected.

The System itself is so simple in construction that there is absolutely nothing to get out of order, not a single mechanical device being needed to operate it. It atomizes the fuel perfectly, burning a clean white fire without a trace of smoke or carbon, which proves conclusively that every heat unit is being obtained from the fuel.

Many fuel experts who have seen the system in operation have pronounced it the most perfect Oil Burning System they have ever seen, as the system not only burns fuel oil perfectly, but burns anything from distillate to the heaviest grades of fuel oil without any changes being made in the System.

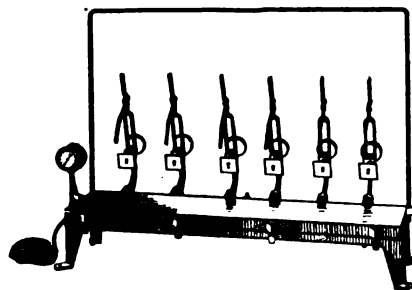
It was during the fuel shortage last year that Mr. Collar discovered that the refuse oil from the motors could be used as fuel in his System, with as good results as could be obtained from the best grades of fuel oil. This discovery is just like finding a small gold mine in his garage for the garage man.

Readers who desire interesting particulars should write to the Collar Oil Burner Co., 1308 Union St., Alameda, California.

New Sepco Electric Vulcanizer

The Automatic Electric Heater Company of Warren, Pennsylvania offers a new departure in electric Tube Vulcanizers. From long field tests it is said that this product has proven thoroughly satisfactory and is now being produced in quantities for the trade.

This vulcanizer is furnished in one size at the present time with an operating surface 8 inches wide by 20 inches long. Due to its rapid heating it is



claimed this vulcanizer will handle the work of any garage or repair shop. Each machine is furnished complete with four adjustable tube arms. Heat is generated by a special electric heating unit which covers the entire base of the vulcanizer.

The casing is made of two heavy steel stampings telescoped and welded together providing a hot air chamber between the upper and lower plates, thus only heated air under automatic temperature regulation is directed against the vulcanizing surface and all necessity for water, steam, or pressure is done away with and there can be no danger from explosion.

A new method of temperature regulation is provided by the Sepco automatic control which is installed directly in the heated chamber so that the vulcanizing surface is maintained accurately at just the right degree which we find is 300 Fht., and is equal to sixty pounds of steam pressure. The operating temperature is indicated visibly at all times by temperature scale on the control. This temperature may be adjusted by the operator either higher or lower as may be desired.

This vulcanizer is furnished for bench operation. It is portable and can be connected to any lighting circuit and is furnished in 110 or 220 DC or AC voltage.

This is an ideal machine for any garage or repair shop and is fully guaranteed by the manufacturer.

Edelmann Spotlight

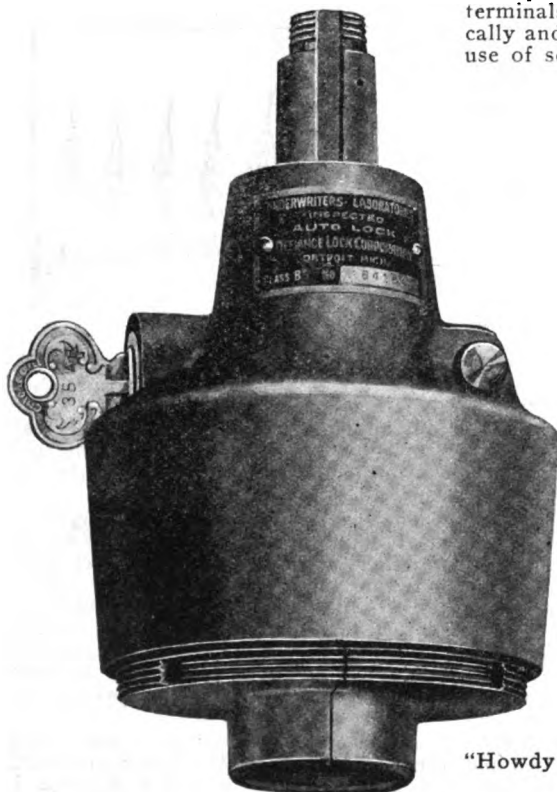
A very attractive neat little lamp is being manufactured by E. Edelmann & Co., 2642 N. Crawford Ave., Chicago, Illinois. It is called the Edelmann Spotlight, and the manufacturers claim that it will throw a light over two hundred and fifty feet.

This single shell reflector spotlight is very reasonably priced, and it will be to the advantage of owners and dealers to investigate. This company also manufactures the Break-Not Battery Tester, the Jumbo Grease Gun and Four-In-One Screw Driver.

The Defiance Auto Locks

Turning the key in a Defiance Lock raises the gear clutch above the lower pinion, throwing the steering gears into neutral. Thus the wheel is caused to revolve freely on the steering post, making it impossible to steer the car away.

Nor can the gears be meshed and the wheel put into driving position unless un-



locked with the key. An impenetrable housing of case-hardened steel completely covers the steering gears and protects them from the tools of the Auto Thief. Thus we have a perfect locking principle—so securely guarded by the hardened steel covering that it Defies the Auto Thief and every means which he may employ.

Another exceptional feature about the Defiance Lock is the Safety plunger. Hundreds of accidents have been caused through the use of locks without this device. Locks have been accidentally locked while the car was being driven, causing the driver to lose control and wrecking the machine.

This danger is eliminated in the Defiance Lock by the Safety Plunger. A Defiance Lock cannot be locked unless this Safety Plunger Button is pushed in with the other hand at the same time the key is turned. Thus, when driving, the steering gears cannot be jarred into neutral—nor can the driver accidentally turn the key in the lock.

Defiance Locks meet with all latest requirements of the Underwriters' Laboratories and are approved by them, allowing the owner reduced rates on his theft insurance.

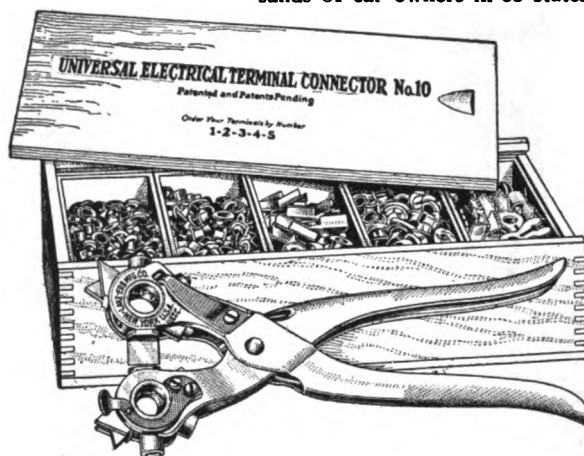
A nicely finished seventeen inch-wheel with genuine walnut rim and highly polished aluminum spider arms is furnished with the lock. Or the lock only can be supplied if desired.

The Defiance Lock is made by the Disco Electric Mfg. Co., 2100 Howard St., Detroit, Mich.

Universal Terminal Connector

Those of our readers who appreciate the necessity for making good electrical joints will be interested in the Universal Electrical Terminal Connector No. 10 which is being made by the Lake-Erb Mfg. Co. Inc., of 405 East 4th St., New York, N. Y.

This device is designed to put various diameter terminals on all kinds of wires from 5/32 to 9/32 in diameter and hundreds of special types, including snaps for spark plugs. With this tool the terminals are said to be both mechanically and electrically perfect without the use of solder.



"Howdy Folks!" It's Spee-Dee in New Collapsible Tube Form

Here's the little story! Spee-Dee which, of course, needs no introduction to the automotive trade—so long has it been serving them as a handy hand cleanser—is making its "bow" in a convenient, collapsible tube. This is in answer to a widespread demand for the product in a smaller container than the can in which it usually makes its appearance.

Just as the garageman and motorist found the can of Spee-Dee a "good pal" to carry along the road or to use in the shop when hands were heavy with grease and grime and there was no water available, now in the overall pockets and in the pockets of the cars of these same individuals is found Spee-Dee in its collapsible container, from which it can be taken as desired—a ribbon of thick, creamy cleanser—fresh and clean.

It requires only a bit of Spee-Dee squeezed into the hands and well rubbed in to make dirt and grime vanish. There's no lye, acid or grit to injure the skin, says the manufacturer. The new form container, as we said before, is particularly convenient—made to fit the side pocket of any car, easy to carry about.

Such a tube proves economical, too, not only in its initial cost, but owing to the fact that the user takes from the tube only as much as he will need. And Spee-Dee from a tube is sanitary, as the unused portion remains in the container, undisturbed and very clean. Each tube holds enough for three dozen "washes."

A "good-looking" label in red, yellow, blue and white, binds the tube, so it's at-

tractive for a counter display, packed with its "brothers" in a case holding three dozen containers.

Prices and more complete data concerning the Spee-Dee in its new "guise" will be furnished upon request. Write to the States Chemical Co., 670 West Austin Ave., Chicago, Ill.

Easy Starting in Coldest Weather

Progressive automobilists are now convinced that heat makes the best primer.

The Pomeroy Electric Co., Inc. of Rochester, New York, manufacturers of the Pomeroy Gasafier have proved to thousands of car owners in 38 states during the

past four years there need be no more trouble starting in winter than in summer.

The Pomeroy Gasafier is a device that takes the trouble out of winter driving. No swearing, hand cranking, battery recharging or teakettles for the car owner who has this device installed.

It is simple, too. Merely a heating coil in gasket form placed between the carburetor and manifold without removing any parts and drawing 10 amperes for less than a minute.

When a Pomeroy Gasafier owner wants to start his car in cold weather he merely turns on the switch furnished with each outfit and by the time his garage doors are opened and he has his controls in position, the interior of the motor is filled with dry heat. Instant starting is assured.

Standard Foot Accelerator

The Allen Co. Inc. of 23 Broadway, Camden, N. J., are marketing a device which will doubtless please many Ford owners. This device is called the "Standard Foot Accelerator," and as the name indicates is intended for application to the Ford carburetor throttle, thus adding a foot throttle to the equipment.

Those who have driven cars fitted with foot throttles, or accelerators, will appreciate the fact that the foot control is far more satisfactory than the hand. The hands should be used only for steering, it is enough for them to do.

The Standard Foot Accelerator can be applied by anyone since it requires no machine work, beyond the boring of the hole in the floor board.

NEW BOOK**Modern Science in the Garage Business**

Compiled by Sidney Osser and published by Automotive Publishers, Box 955, Columbus, Ohio. Mr. Osser has had over 17 years experience in the various branches of the automotive industry and has conducted a number of special courses in automotive engineering. In his book, Mr. Osser covers the field generally from both the theoretical and practical standpoints.

The book is full of good, "Hoss Sense" and tells the garageman how he can not only go out after and get good business but how to make the most of present opportunities.

Ford Car, Truck and Tractor Repair

Compiled by Alfred A. Good and published by the McGraw-Hill Book Co. of 370 Seventh Ave., New York City. Mr. Good was formerly the director of the Ford Motor Company's Service School and even a casual examination of his book would show that he knows the Ford car from its crank to tail light.

To say that the book is comprehensive is not to give it due justice for it is the most complete work of its kind we have ever had the pleasure of reading. It contains valuable data in the shape of parts measurements and it is so complete that one might easily duplicate the mechanical parts from the data given in it. The book is invaluable to the Ford repair man.

Pneumatic Tires

Compiled by Henry C. Pearson and published by The India Rubber Publishing Company of 25 West 45th St., N. Y. City. Mr. Pearson is Editor of "The India Rubber World" and an accepted authority on rubber. The book contains over 1300 pages and is copiously illustrated.

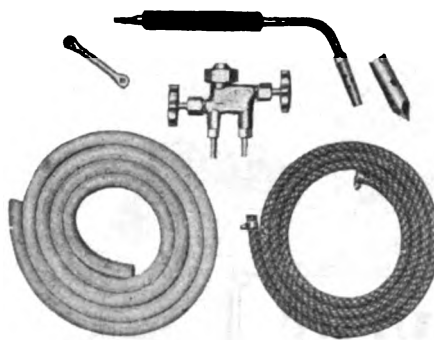
In this book the history of rubber is considered and the rubber is followed from the sap to the finished tire. Every man who has anything to do with the repair of tires will find that this book is very valuable, for it tells the whole story and it is the first time, to our knowledge that full justice has been done to the subject.

The book not only covers the manufacture of tires in all its branches, but the generally accepted methods of making all kinds of repairs, both to tires and tubes. Various kinds of machinery are illustrated and it is fair to say that the illustrations alone are sufficient to tell an understandable story.

Radio Phone and Telegraph Receivers

Compiled by M. B. Sleeper and published by the Norman W. Henley Publishing Co. of 2 West 45th St., N. Y. City. With the popular craze for wireless apparatus at its height, practically every man in the country needs to keep himself informed as to the advances made in this science. This book is written mainly for beginners, but it is complete enough to be of great value to every radio "fan."

The book covers the field completely, is fully illustrated and written in a language which may be understood.

The WASHBURN Torch**OXY-ACETYLENE HEATING EFFICIENCY
AT $\frac{1}{3}$ OXY-ACETYLENE COST**

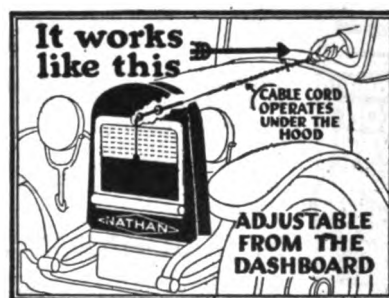
How many times, Mr. Garage-Man, have you wished for a quick heat for some little job—one adaptable for Radiator Soldering, Brazing Fenders, Lead Burning or Straightening a Frame? The Washburn is constructed to meet such requirements. Produces a needle point flame with a guaranteed, easily controlled temperature range of 4000 degrees Fahr., 5300 degrees High. Burns 15 parts air to 1 part gas. Adapted for use with A, B or E size Prest-O-Lite tank and Garage air line. Sold complete as shown above

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RADIATOR COVER
OPERATES from the DASH

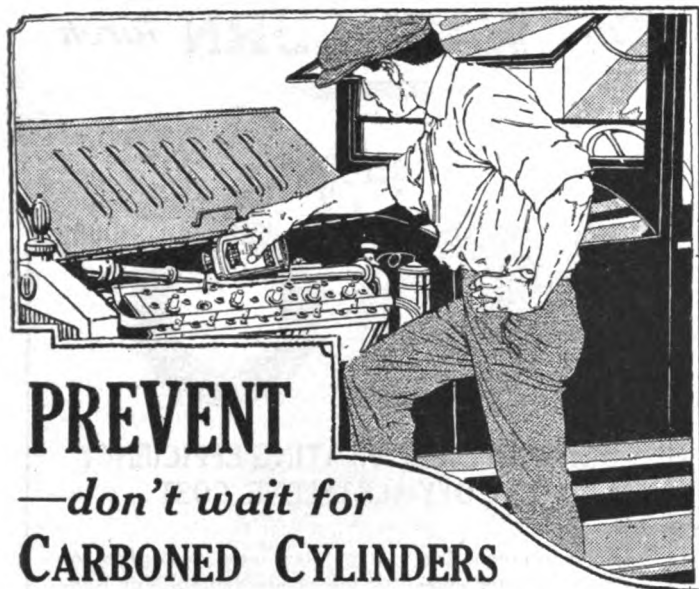


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PREVENT —don't wait for CARBONED CYLINDERS

DON'T wait until your cylinders are choked with carbon. Prevent this nuisance by using Johnson's Carbon Remover regularly. The use of Johnson's Carbon Remover every 500 miles will keep your motor running quietly and full of "pep"—will prevent carbon formation—will reduce your gasoline consumption from 12 per cent to 25 per cent and give you maximum power and speed.

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Mail the attached coupon for our book, which tells how to reduce automobile depreciation with Johnson's Car Savers.

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Send for this book—NOW

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Please send me free and post paid your book on "Keeping Cars Young."

Name _____

Address _____

Dealer's Name _____

TROUBLE DEPARTMENT

(Continued from page 43)

the ground connections with wires from the lights to the negative battery terminal. But this supposition is based upon the assumption that the frame of the car between the headlight grounds and the negative battery connection offers more resistance than would a wire. It will cost you but little to try the experiment at any rate.

Water Vaporizers

3148

From C. C. Timmons, New Hampshire: Some years ago much was said and written about water vaporizers as being excellent devices for the prevention of carbon in gasoline engines. At the present time, however, not much is being said and I seldom see any advertising literature covering them.

I am driving a Marmon car and would like to know if, in your opinion, a water vaporizer will add to its power, reduce fuel cost or prevent carbon formation in the cylinders.

Reply: In the columns of our magazine we have frequently mentioned the fact that there are two kinds of carbon formation in automobile engines. The first type is soft and mushy, remaining moist with oil most of the time despite the intense heat of the combustion chamber. This type of carbon formation is the direct result of oil seepage into the combustion chamber from the oiling system or the base of the engine. The second type of carbon is hard and dry, often adheres to the pistons and cylinders in flakes which must be scraped off with a sharp tool of some sort.

A good water vaporizing device will usually reduce the first type of carbon in the combustion chamber even after it has noticeably reduced the power of the engine. But a cure cannot be effected unless the cause is first removed.

Once the second type of carbon has formed it cannot be removed satisfactorily by the admission of water vapor. The second type of carbon will form with the present day grade of fuel and the only thing you can do is to slow down the rate of deposition by the use of water vapor.

A water vapor device is not a "cure all," nor can it be said that it will always help. But the chance that it will help matters is so great that the investment is merited. Practically all vaporizing devices are built on the same principle and we have no particular favorite.

RESULTS OF MALNUTRITION

A certain young man from Lynn,

Was so painfully, terribly thin,

When he went to his tire,

To give it some air,

Slipped up on the valve and fell in.

LIGHTING THE DITCH

PRACTICALLY every night driver is disgusted with this phase of motoring because of lighting conditions. Unless he equips his car with more powerful lights than "the other fellow," he cannot see past approaching headlights. But when he adds to his lights, he disturbs "the other fellow," who in retaliation must also add to his lights.

If the various State automobile laws did not offer a check to the practice we would all be carrying a pair of miniature suns on the fronts of our cars. The question of glare is a peculiar one and really has no solution for the amount of illumination is no index to the glaring properties of the headlights.

The C. A. Shaler Company have hit the nail on the head when they say that the term "glare" is purely comparative. Drive your car in pitch darkness and even a candle would glare in your eyes. Drive your car in the sunlight and you can approach an arc light without any sense of discomfort. The answer to the glaring headlight problem is obvious, illumine your road properly and approaching lights will not bother you.

Now we do not intend to suggest any particular type of headlight lens, dimmer or illuminating device; our suggestion is along a line which has never, so far as we know, been thought of. If you care to adopt our suggestion you will find that you can dim your headlights in the face of two glaring lights and still see the road and ditch on your right. But before you adopt our suggestion be sure to read your State laws and see that you do not break it. Our suggestion will comply with the laws in a majority of States, if not all.

On your right, rear mudguard, mount a regular headlight. Mount the light in such a way that it comes below the body line of the car and in the mounting, be sure to adjust it so that it casts its beam straight ahead. You will find that the body of the car will form an effective shield for the beam so that absolutely no light will be thrown left of the center of the road. Hence it cannot glare into the face of the approaching driver.

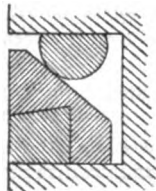
In wiring up the light try to fix it so that when you throw the regular wiring switch to "Dim," this auxiliary light will be thrown on. Under all normal conditions, however, this light will be off.

In cases where a "push-and-pull" headlight switch is employed, the auxiliary light is easily wired to conform with the above paragraph. Run a wire direct from the battery to the light, through a 10 ampere fuse if possible, from the light to a brass spring back of the ignition switch. Fix this brass spring in such a way that the pulling or pushing of the dimmer switch grounds it. In this case a double contact socket in the auxiliary light is necessary.

So long as this auxiliary light conforms with all headlight laws and does not come in the "spotlight" classification, you can feel safe about it; but to be sure it will be a good idea to question your local license bureau or one of the State Traffic squad.

**"particularly effective in
overcoming oil-pumping"**

PRESSURE PROOF PISTON RINGS



"Rings . . . that, due to their design, stay tight in the grooves throughout their life. A typical ring of this kind is shown . . . This ring we have found particularly effective in overcoming oil-pumping under a wide range of conditions."

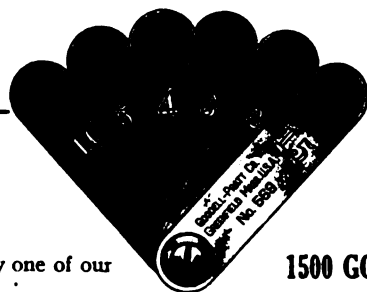
*Extract from a paper read by a prominent
Automotive Engineer at a meeting of the
Society of Automotive Engineers.*



PRESSURE PROOF PISTON RING CO.
107 Massachusetts Ave. Boston, Mass.

Feeler Gauge

No.
569



This is only one of our

1500 GOOD TOOLS

This popular Gauge has six leaves, giving all combinations from 0 to .039 inch and will answer all ordinary requirements for automobile repair.

Write for booklet, "Tools for the Motorist"

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COMPANY**

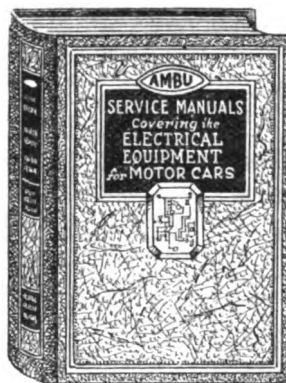
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Contains a Battery Table, which furnishes the make, type, voltage, ampere, hour capacity, dimensions and order number of the battery used on each particular car.

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We want men taking orders for Insyde Tyres. Positively prevent punctures and blowouts. Give double tire mileage—any tire old or new. Use over and over again. Old worn out casings give 3 to 5 thousand miles more service. Enormous demand. Low priced. Spare time or full time \$6 to \$12 a day. Write for agency. American Accessories Co. B-511 Cincinnati, Ohio.

AGENTS WANTED—something new—Fire Fighter sells easily. Makes a spectacular demonstration; car owners, homes, factories, stores, practically buy on sight. Our men make \$10.00 to \$50.00 a day; exclusive territory. If you wish to establish a business of your own with unlimited possibilities for making big money, write us today. F.Y.R.—FYTER CO. 953 Fyr-Fyter Bldg., Dayton, Ohio.

WANTED—Men with Ford cars to sell Stokes Carburetors. Exclusive territory given. Write for particulars. Stokes Carburetor Co., Inc., Good Ground, Long Island, N. Y.

EXCLUSIVE AGENCY for Paste Soap and Metal Polish. Connecticut Can Co., Park St. at New Park Ave., Hartford, Conn.

Opportunities

Weezy—Squeaky—Springs soon break. Compton Spring Oilers prevent breakage by automatically lubricating spring leaves making smooth riding. Quickly attached without drilling or changing parts. Send \$4.00 complete set eight oilers; Special Ford Set \$2.00. County agents and wholesale distributors wanted. Box 14, Compton Company, 29 Broadway, New York.

Magneto Charging

Re-Charges All Magnetos Re-Charges All Ford Cars Trucks and Tractors

The "Colpin" magneto Recharge for Ford cars clears all "SHORTS" in the magneto coil and Recharges the Magneto to full strength in less than 5 minutes without removing a single bolt or nut "No storage batteries needed," it operates from any alternating current light socket; will also operate from Farm lighting plants, Direct current circuit, storage batteries and dry cells. Nothing to wear out, No up-keep cost. Weight 12 lbs. Used and recommended by Authorized Ford Dealers.

Has high grade tester for testing before and after charging and to find field coil shorts and end play in bearings, charger will clear timer shorts, test wiring system, Starters and Generators, sold with understanding that if the charger fails to do the work and all that we claim of it, we will refund purchase price. Price \$57.50 prepaid. \$30 to \$50 cash with order, balance C. O. D. Cheapest and only successful charger on the market. Order today. Distributors and Agents wanted. Magnetizer Mfg. Co., 146 West Florence Ave., Dept. M-6, Los Angeles, California.

MAGNETO RECHARGER—Fords in car, other on bench, Alternating, Adjustable Amperage 10-35, Tester, Trial, Guaranteed, State Distributors wanted, producers, prices, detail. (Reliable) 426 Mary St., Utica, N. Y.

Help Wanted—Male

INSTRUCTOR WANTED—Excellent position open for experienced instructor automobile electrical and storage battery subjects. Year round work in modern trade school teaching several trades, located in Honolulu, where you never see snow and can go swimming in the ocean Christmas. Temperature rarely above eighty degrees. Population of Honolulu about 100,000 composed of several nationalities. Fair salary and bright future to right man. Write, giving full particulars about education, experience, present employment, also salary received and wanted. Enclose photo. Y. M. C. A. Trade Schools, Honolulu, T. H., U. S. A.

Information Wanted

WANT to hear from owner having automobile or other business for sale. Give cash price and particulars. John J. Black, 223rd St., Chippewa Falls, Wis.

For Sale

FOR SALE: Patent rights on force feed oil cans. Otto Schleif, Deshler, Nebraska.

Patent Attorneys

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PATENTS SECURED—C. L. Parker, Patent Attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice of four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St. New York City.

Ford Starters

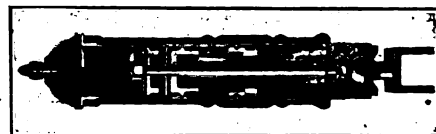
SIMPLEX STARTER FOR FORD \$20. Guarantee. Easily installed. Simple, Durable, Satisfy. Secure agency in your territory. Big profit selling them. American Simplex Co., Anderson, Indiana

Gruss Air Springs

A shock absorber, or more properly an air spring, which seems to be scientifically correct is being manufactured by the Cleveland Pneumatic Tool Co. of Cleveland, Ohio. This device is designed for both cars and trucks and employs no springs, the weight of the machine resting upon a cushion of air at all times. The air pressure may be adjusted to conform with the weight of the machine and is pumped into the device when it is installed.

The construction of the gruss air spring is very interesting. It consists of the main body which is clamped to the frame of the car or truck. Inside of the main body is a steel sleeve, fitted to the body and sliding in it. The sleeve, which is attached to the spring of the car or truck, also carries a plunger which is fitted at its upper end with a packing gland.

The sliding plunger travels inside a second sleeve which is attached to the main body. Thus the plunger unit slides inside the main body and outside the main body sleeve while, at the same time, its upper end slides inside the main body sleeve. This combination forms two air chambers.



The lower chamber is filled with oil, the upper chamber is partially filled with oil and air is pumped under pressure into it with an ordinary tire pump until the lower plunger balances in the body of the device.

Under these conditions the car hangs upon a cushion of air and downward shocks are absorbed by a second cushion of air in the top of the device. The cross sectional photograph herewith shows how the device is constructed.

Radcliffe to Supervise Victor Sales

The H. L. Rackliff Company, automotive marketing counselors of Cleveland and New York, have been retained by the Victor Manufacturing Company of Dayton, Ohio, manufacturer of motor products and accessories to supervise Victor sales and advertising activities.

O. H. Motts formerly Director of Sales of Jordan Tire and Rubber Company and previous to that associated with Ideal Tire and Rubber Company has joined this company.

Glass Cutters Smith & Hemenway Co., Inc.	7	Polishers Saint Louis Machine Tool Co.	10	Tire Pumps Anthony Co.	14
Grinding Compounds Zip Mfg. Co.	19	Pump, Tire Anthony Company, The	14	Tire Repair Equipment Akron Rubber Mold & Machinery Co.	6
Growlers Nichoff, Paul G., & Co., Inc.	7	Pliers Smith & Hemenway Co., Inc.	7	Miller, Chas. E.	6
Gears Brown-Lipe-Gear Co.	8	Premier Electric Co.	61	Shaler, C. A., Co.	Front Cover
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Hoists (Auto) Weaver Mfg. Co.	3	Morse Twist Drill & Machine Company	14	Will B. Lane Unique Tool Co.	14
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Metal Repairs Smooth-On Mfg. Co.	10	Stoves, Camp Vanderpool Co., The,	18		
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Oil Gauges Reliance Automobile Devices Inc., Fourth Cover	15	Timers Dale Mfg. Co.	15		
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Patches (Tire Repair) Auto Pedal Pad Co.	10	Tires Miller, Chas. E.	6		
Miller, Chas. E.	6	Henry Cord Tire Co.	2		
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Pressure Proof Piston Ring Co.	59	Tire Fillers National Rubber Filler Co.	4		
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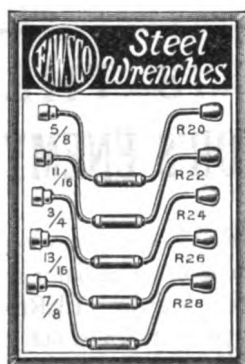
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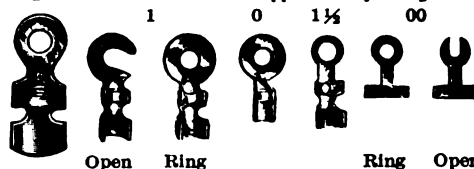
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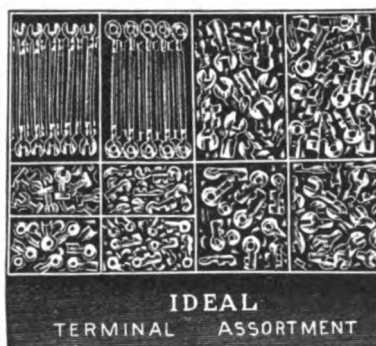
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THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 16-22 Hudson Street - New York City

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OCTOBER, 1922

Monthly \$1.50 per
Single Copy 15c



This Counter Display Will "Ask 'Em to Buy"

Write for it now. But better still—ask for two—one for your counter and one for your window. You can't run around and show customers everything that you sell—but this display will tell every one of your customers that you sell Shaler 5 Minute Vulcanizers, and Shaler Patch-&-Heat Units. It's the best "Sales Stimulator" that you ever saw—a "Magnet" that will draw new customers into your store if you will merely put it in your window. It brings 'em in to buy.

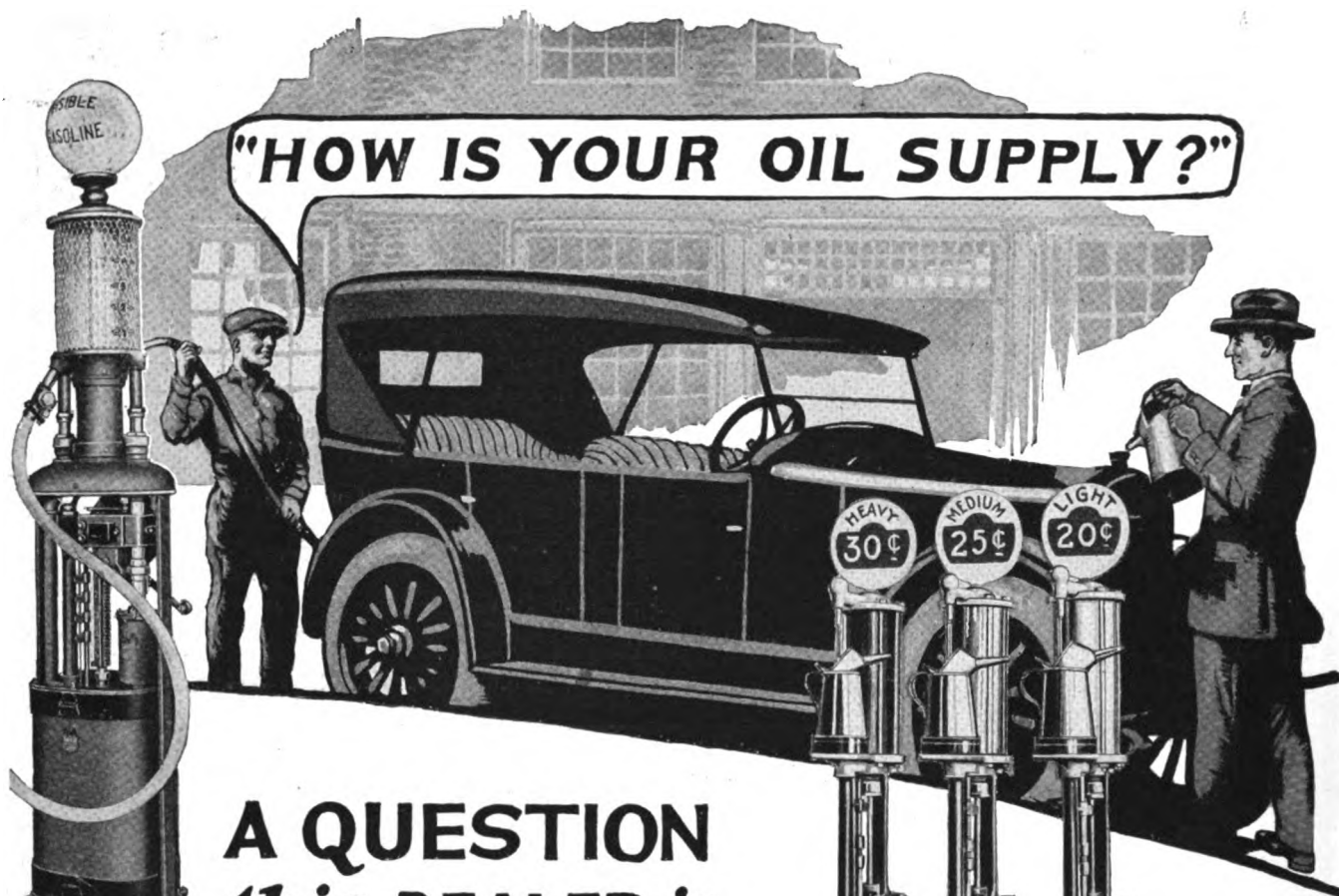
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Because he is equipped to give *quick service*—
Because his three grades of oil are *visible*, in *clean*
containers, and conveniently located—
Because he wants the motorist to know he is *pro-*
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And the customer is quick to recognize these facts, to ap-
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Oil pays the dealer a *substantial* profit. The average
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Make that service attractive and you will get the *big*
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The motorist takes the same pride in his car that the
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horseman, he wants it fed with *clean* material in a
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The American Lubricating Outfit serves *clean* oil. It
serves it *quickly* even in cold weather because the

pump *forces* the oil into the measure. There is no
dripping from the spout—no waiting for gravity flow.

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out of the garage—holds three grades of oil, and
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The only successful way to meet competition is to
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Automobile Dealer and Repairer

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VOL. XXXIII. NO. 8.

OCTOBER, 1922

PRICE { 15c per copy
\$1.50 per year

An Interesting Machine Shop

Some Devices and Tools That Make
Difficult Jobs Easy To Handle

By Howard Greene



FRANK," said Uncle Billy one raw, rainy morning in December, when it was too mild to snow and not mild enough not to, as the old gentleman said, "Frank, this here little shop of ours is a purty good little shop, fur's it goes. We got all we need to do the work we have to do. But there's lots of things we ain't got, an' it's my idee that you'd ought to know more about some of them than you can find out here. Today's an off day for me, an' I guess the shop won't go under if you're absent for a few hours, so let's go over to Garvey & Smith's place an' get old Garvey to turn us loose to browse around in a real shop where they do real work of all kinds and all sizes. How about it, boy?"

"Suits me," Frank came back, "right down to the ground. The truth is, I don't feel a whole lot like working anyway. Besides I've wanted to see that shop for a long time. Fine business!"

So over they went to Garvey & Smith's.

"Hello, Billy, hello!" was old man Garvey's cordial greeting. "What's the matter that we haven't seen you for so long? You ain't layin' low an' makin' plans to drive your old pal out of business, are you?"

"Not much I ain't" laughed Uncle Billy. "I've just brought over my nephew Frank. I'm tryin' to pound some machine shop knowledge into his wooden head, but there's things in your place that there ain't in mine, so I want to ask your leave to make your shop Exhibit A for the sake of the boy's education."

And Uncle Billy did the introductions, and old man Garvey and young Frank shook hands, and old man Garvey said they could have the whole darn shop to play with,—“only don't take away any of the heavy tools, because there was some big work comin' in next week an' they might come in handy.”

It was, as Uncle Billy said, a big shop, and it was seldom that a job came in that was too big to be handled in some way.

"As a starter, Frank," Uncle Billy began in his best and most impressive lecturing manner, as soon as they had

found their way into the main shop, "you may notice that what you have learned about lathes an' planers an' the like will make all these other tools more or less easy to understand. The cuttin' part of it works on the same principle all the way through, as far as the cuttin' tool an' its relation to the work is concerned.

"Look here, for instance." They stopped before a large slotting machine, which was deliberately and steadily cutting a generous keyway in a nine-foot flywheel. "This is nothin' but a planer built for this sort of work with the tool workin' vertically instead of horizontally. Get it?" Frank got it all right.

"'Course you can't put a job like that on a planer. You might build a horizontal machine that'd do the work; but what's the use of doin' a lot of riggin' to hold a job that can better lie flat? Most of the slotter work lies flat, so—well, so they build 'em this way.

"I get it" said Frank. "The cutting tool is just about the same as a planer tool and the general idea's the same."

"Right-o. Now here's something that's interesting, an' you can see the whole idea for yourself."

It was a radial drill, with a heavy swinging arm carrying a tool carriage which slid on ways and could be set at any distance from the supporting column.

"See what a handy rig that is? S'pose you've got a job to be drilled, but, because it's an awkward shape, or a big size, you can't handle it in any ordinary drill-press. You just block it up alongside the radial, settin' square an' plumb, swing the arm over it, run out the tool head and drill away. No bother about gettin' the job accurately located, because the tool goes to the work, for the most part."

"How does she drive?" Frank was peering around the somewhat complex-looking mechanism of the driving head. "Oh, I see. Vertical shaft in the column with a spline drive to bevel gears—what's the idea of the spline in the vertical shaft? Got that too. The whole arm can be raised and lowered and the gear slides on the shaft that drives it. Some rig on the drive through the swinging arm—splined shaft and bevel gears driving the drill spindle."

"Yes; I thought you'd get it right off the bat. By the way, here's a mighty interesting machine, an' I guess we ought to have one like it in our shop. Looks just about like an ordinary well-built lathe, doesn't it? Take a look an' see what you can make of it."

Frank took a look and was puzzled at first.

"Looks to me as you say—about like a good lathe and nothing else" he said. "But the bed looks mighty deep and heavy—hold on! I'm wise now. There are two sets of shears, one on top of the other. What's the scheme? I suppose it's to extend the bed for long work."

"That's part of it" agreed Uncle Billy. "But that isn't all of it. Here's the way it works. You turn this handle" and Uncle Billy suited the action to the word and turned a handle at the extreme right, or tailstock, end of the lathe, "and the shears proper slide out. That extends the bed, of course, for long jobs. But at the same time it opens up a gap under the face-plate. Now you see you have a gap lathe with a gap that you can make just as wide or just as narrow as you like, which is a mighty big convenience. And you can bring your tool carriage right to the work without overhang if you're working on a narrow job with a big diameter, so you won't get any spring. It's great stuff. The machine is really stiffer and more solid than an ordinary gap lathe, and it's great stuff having a bed that can be worked out to nearly double the regular length."

"Gee!" ejaculated Frank, "It's just about two lathes in one, isn't it?"

"Umph" grunted Uncle Billy. He was deep in a close inspection of the machine and, truth to tell, one of the reasons for the visit was that he wanted to make that very inspection. So Frank nosed around the machine at the same time.

"Well, let's move along" said the old man, finally. Let's see what's next."

"There's something you haven't got" suggested Frank, pointing. "Looks like a little planer with an emery wheel instead of a cutting tool."

"Well, that comes pretty close to describin' it" replied Uncle Billy, as they moved toward the busy affair.

"Here's the idea" he continued, as they stood by the machine. "Suppose you have a job that calls for a flat finished surface that must be dead true. Well, you simply can't machine a surface real dead true. You may think you can. But you try it, an' do your darndest, an' then put a surface plate on the job an' you'll find out quick. For one thing, metal always varies a leetle mite in hardness. The tool goes deeper in the soft places an' not so deep in the hard places, an' you can't help it. Then the more you use a tool the more the point wears down—not much, but enough to make some difference. That's another thing. Then when you take metal off it generally releases a little tension and lets the job spring ever so little. Well, all these things put together are enough to throw the job out enough so that if you want it dead true you've got to finish it up with a scraper an' surface plate—or else put it on a grinder like this one here, or one of its relations."

Frank was standing watching the machine work. The job was clamped to the bed, which traveled back and forth just like a planer bed. In place of the planer tool, however, was a small abrasive wheel driven at high speed by its own little electric motor. The wheel was just grazing the surface. At each stroke of the bed the wheel carriage was fed over a little.

"Watch now, Frank!" exclaimed Uncle Billy. "This here job ain't been started long. It was a good machined surface; see, you can make out the tool-marks easy. Pretty good job, all right. But watch the wheel graze it. Now she's takin' a pretty good bite; makes the sparks fly. There, now! The wheel ain't even touchin' the job. See! a low spot. That proves what I was sayin' about the impossibility of makin' a true surface by ordinary machinin'."

"Nice work." Commented Frank. "Pretty slow, though, isn't it?"

"Depends" said Uncle Billy. "You tackle that there job with hand scrapers an' a surface plate an' you'll think the machine's pretty darn fast, I can tell you. An' if you don't believe it" he continued, grimly, "you will next week, for I'm going to give you a fair-sized job to surface up, an' it's got to be done right."

And, incidentally, Frank decided before he got that surface "done right" that the surface grinder was a veritable wonder, and he said as much to Uncle Billy, who grinned broadly and said nothing.

Well, anyway, Uncle Billy, after watching the grinder for a while looked up and found Frank missing. Presently he found him standing by another grinder with an intensively puzzled expression on his young face.

"What the dickens!" muttered Frank, as the old gentleman ranged alongside. "I sure don't get this thing at all. Here's a fellow laying a job on the table and running a grinding wheel over the surface without clamping the job down. Yet it stays there while the wheel takes a good bite, and when the job's done he just slides it off as easy as he slid it on. What the dickens!" he wound up, his brows knitted.

Uncle Billy laughed.

"Ever hear of a magnet, son?"

"Yes, but what's that got to do—you don't mean to tell me that the bed is magnetized?"

"Sometimes it is an' sometimes 'taint," was the somewhat enigmatic reply. "Here's the idee, Frank. There's a coil of insulated wire buried in that table casting. When an electric current is sent through the winding the bed's magnetized an' the job, if it's iron or steel, is held down good an' solid. The feller turns on the current while the job's in place, an' there it stays till the work's done. Then he switches off the juice an' right away there ain't no more magnetism an' all he has to do is to take the job off. Watch him, now. See him work that switch?"

Frank watched for a while longer, understandingly.

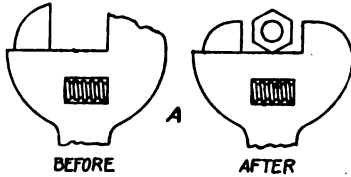
"Well," he said at last, drawing a long breath, "Well, I'll be darned!"

And he let it go at that.

WHAT TO DO WITH BROKEN WRENCH

POOOR tools are an abomination and about the worst of the lot is the wrench with a half-broken jaw. It doesn't make any difference whether it is a monkey wrench or its lighter brother, the "bicycle" wrench or an S wrench or a solid wrench. But somehow or other the end of one jaw will get broken off leaving the other one, roughly, a half inch longer.

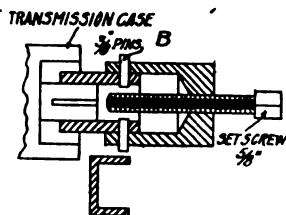
Such a wrench is the next thing to none, and most people throw it away, but it can be restored to usefulness by grinding down the long jaw and making it the same length as the broken one.



As made, wrench jaws are the proper size for ordinary work within their range but shorter jaws can be used as well in many cases, so that a corner chipped off or even half of the length gone does not prevent the owner from getting a lot of good out of the tool. Sometimes a jaw is tempered too hard and cracks when pressure is applied but, usually, misuse is the cause of breakage—and, a short-jawed wrench is safer for a careless man than a good one.

A SIMPLE AND POWERFUL PULLER

THE drawing shows a puller that was made up hurriedly for a truck repair job. It was one of those lengthened chassis jobs which had an extra length of drive shaft put in back of the transmission and the extension had been put in without a universal—just an ordinary sleeve coupling being used.



It was desired to get this coupling off to do some work on the transmission but the location was such that no puller could be used and there was no chance to get behind and drive. There was, however, a pin hole through the coupling in addition to the keyway and this hole was used to secure a grip. And this grip was sufficient to overcome a tight fit and rust.

A MOVABLE BENCH

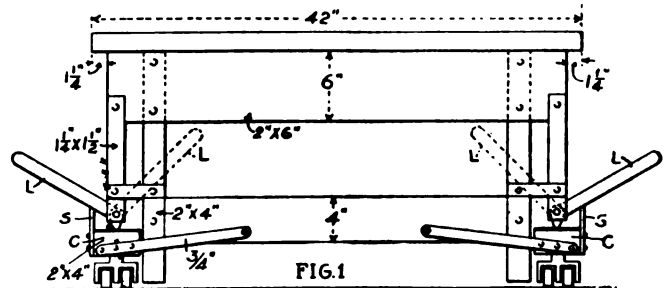
By Edwin Kilburn



A GOODLY portion of the work in garages and repair shops is upon motors, transmissions, small stationary gasoline engines, etc. These articles are inconvenient to repair upon the ordinary work bench owing to the fact that the bench is too high. If placed upon the floor, the work is too low for comfort and furthermore, there is the danger of getting grit, etc. into the working parts. We use, in our shop, a device which we term a half bench which has several advantages in this class of work.

The accompanying sketches, numbered one and two, present a very good idea of this device. In these sketches both a side and end view are given and the device will be seen to consist of a bench the top of which is approximately 22 inches from the floor.

This bench is very substantially constructed, the side members supporting the top being dressed two by six material, the top being of dressed two by eight material which is fastened to the supporting pieces by large wood screws.



The top of the bench is covered with galvanized iron, the iron extending down far enough to be locked under the pieces forming the top and being fastened with nails driven through the iron where it is turned down on edge of the top. This makes a top which is easily kept clean and not subject to being damaged by bruises as is a plain wood top.

The frame work supporting the top is made of two by four stock, the four legs being notched to fit the side members of the top as shown and being bolted to same to form a rigid joint. The pieces which hold the legs in position at the lower ends are mortised and tenoned where they fit the legs and are held in place by suitable draw bolts.

Thus far this bench follows the specifications of any work bench in regard to structural features. However, a bench of this type, unless fitted with some means whereby it may readily be moved over the floor when carrying a heavy load, would often be rather inconvenient.

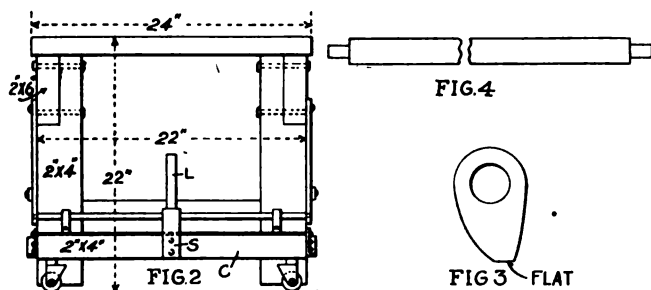
In order to make this bench readily portable, we designed an easily operated mechanism whereby, when desired, the bench is set upon the floor resting upon its legs, and when it is desired to move the bench, by

operating two easily controlled levers, the bench is mounted upon four castors and may easily be moved to any position desired in the shop.

By referring to figures 1 and 2, there will be found upright steel pieces marked quarter by one and one-half inch steel, the upper ends of which are bolted to the top supporting pieces. These steel pieces are supported in position near the lower ends by steel braces which are attached to the upright leg pieces of the bench.

There are two rock shafts pivoted at the lower end of these steel upright pieces as shown, these rock shafts having levers LL attached to them and also having two cams fitted which, when the levers LL are thrown in position shown by the full lines, bear upon steel plates which are attached to castor carrying members CC. These castor carrying members are pieces of two by four material with castors bolted near each end. These castor carrying pieces also have attached to their ends three-quarter inch steel angle pieces which are pivoted to the sills or connecting pieces which connect the legs at each end of the bench together. The two by four carrying the castors is cut long enough in order that three-quarter inch angle pieces will just clear the framework of the bench.

It will be seen that when the lever is in position shown by full lines that the cams will bear down upon the steel pieces fastened to the castor carrier piece and thus raise



the bench clear of the floor. There are stop pieces SS provided to limit properly the travel of the levers LL, in order that they may maintain the cams at the position which will give the greatest elevation to the bench.

When the levers LL are moved to positions shown by dotted lines, the cams are released from the castor carrying plate, and allow the bench to rest firmly upon the floor. These cams should be made of approximately the form shown in figure 3 where it will be noticed that at the point of greatest throw of the cam, there is a flat spot which makes it easy to maintain the lever in the desired position when the bench is elevated. The rock shafts shown in figure 4 are made with a reduced portion at each end where they fit the holes in the quarter by one and one-half inch steel pieces in order to prevent their moving out of place lengthways.

This bench is readily constructed, is inexpensive, and very useful in any repair shop.

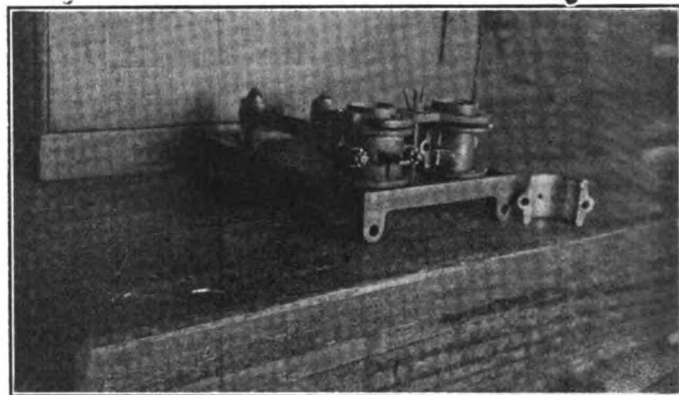
Don't forget that one of the most important phases of producing satisfied customers is the handling of complaints.

CONNECTING ROD BABBITTING BEARING JIG

By A. L. Prindle

HERE is a satisfactory babbitt jig which is used for preparing bearings for connecting rods. It is entirely homemade but saves a good deal of time and the cores which are especially patterned provide oil recesses automatically.

The whole jig is mounted on a cast iron block. Two iron pins take the piston end of the rods and the crank



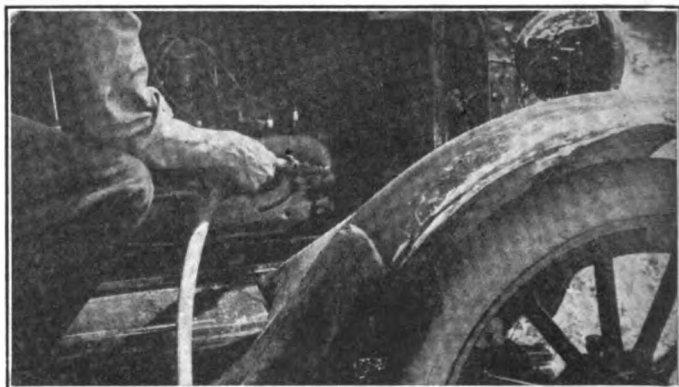
case bearings fit over the inner cores which are of steel and plated with a hard alloy to prevent the babbitt from bonding when being poured.

This device cares for two connecting rods at a time and much time is saved with its use. The photo shows two rods in place with one half of the bearing removed to show the oil recesses which are formed by the inner core.

WASHING THE AUTOMOBILE RADIATOR

By Dale R. Van Horn

LITTLE does the casual car owner realize, as he stands perhaps of a Sunday morning idly washing his car radiator, that he may be doing a serious injury to his beloved servant. Playing the small, powerful stream



of water back and forth across the front, it cleans the honey combs all right, *of course*, but the water going through—what becomes of it? That is the question.

The next time you catch yourself doing this very thing look under the hood and see how much of it runs down over the wires and generator. Unless the housing for the electrical parts is very tight some of the water is bound to work in, and if it strikes the right place is sure to produce a short. Then you wonder why the wiring goes bad so quickly.

The photo shows a much better and safer way to wash the radiator. In this way the material lodged therein is not only forced out the way it entered, but all danger of shorting is eliminated. If the hose is provided with an adjustable nozzle it will be easy to do the work. And then, when the job is finished, you will know that

there is no water lodged in any of the places where it shouldn't be. It's better to be safe than sorry.

THE STRENGTH OF WOOD WHEELS

It is stated as a fact that the strength of a properly designed and well manufactured wood wheel, whether for a light passenger automobile or for the heaviest kind of a commercial truck, has never been questioned by any one.

This for the simple reason that wood wheels have proved their ability to carry any load which a motor can propel and upon any roadway over which a vehicle can be driven. *(From the Story of Wood Wheels)*

Setting Mile-Posts on Prosperity Highway

Are You A [Booster-Is Your Optimism Helping To Build Up Business In Your Community and Increase Your Own Profits?

By A. B. Cassett



IT is a matter of simple fact that the prosperity of the American people is now in their own hands. By their own volition they can bring about a steady buying period.

Real prosperity is at our doors in any event but a cooperative determination to cast off the fetters which doubt and fear have forged, will make for big business now.

Now is the time for good Americans to resume the life and habits which held sway before the depression set in. The short period of inflation is a thing apart and has nothing whatever to do with what we generally term "good times."

We do not counsel extravagance, but we urge that niggardliness is no longer necessary or beneficial, not even to the man who practices it, for we live in a world whose benefits are always interdependent.

Money must circulate if business is to be good. No matter how much money each of us may have, if we spend nothing, sell nothing and buy nothing business can be nothing else but bad. Each of us must do our own share.

If our great people (and they will) resolutely shun the phantom of doubt and purchase those goods that they need for the home, the garage, the car, farm, factory, store and office, each man will be delighted at how speedily he will find his own enterprise duplicated by his neighbors. This is how prosperity will be made. The general depression of late would have been a good deal worse had it not been for the stimulating effect of the enormous purchases that have been made in all kinds of building material.

It has been fully established that business conditions are made better by hopeful talk, and depression by discouraging talk. To be really prosperous a merchant must be thought to be prosperous. We must put ourselves in a prosperous attitude, so that people will regard us as prosperous, but this does not mean that you must put a death clutch on your bank roll and choke it to death and then try to throw a bluff that you are a spendthrift.

No over-spending is necessary—just a general loosening up. Buy what you need—stop thinking that we're going to have another war—stop thinking that we can't get along without Russia—stop giving credence to foreign news that tells you how poor we are without Europe's glad hand—stop believing that we ought to cancel foreign debts to make the world happy—stop believing that there are millions of idle men—there are not—for men have gone back to work by the thousands.

Believe that you are living in the greatest and grandest country on the face of the earth—believe in all the Presidents from Washington down to and including President Harding—don't be too flustered about the Senate, the Congress, the tariff or the bonus—all these are ordinary every day happenings—we're human—we've got to have something going on so that the newspapers can get your little old two cents in the morning. You don't have to carry the news with you—you can leave it in the car.

Get down to the plain cold fact that fundamentally business is as sound as an American dollar. Best of all believe in yourself and your personality.

The man or woman who thinks the physical condition of the pay envelope is governed solely by the amount of work done is mentally short-sighted and needs new spectacles. Of course, ability to do work well is the first

consideration in the world of business, and personality without ability is not negotiable in that world. But ability plus personality means success of the best sort nine times out of ten.

And of all the attributes of personality which attracts others, cheerfulness is easily first.

Stevenson said: "A happy man or woman is a better thing to find than a five pound note." The word "cheerful" may be inserted for "happy" without necessitating any further change. And the attitude denoted by this word is worth many a five pound note to any person who possesses it.

And the paying teller in the bank of life is always ready to honor a check of good cheer, even though he hands you in exchange for it nothing more than the satisfaction of having added to the deposits in the vaults of human happiness.

But he usually gives you more than this; as a rule, the bread of cheer you cast upon the waters comes back some time or other a pound-cake of sure-enough profit. For good cheer is contagious as well as cumulative, and it has a way of going well with anything and everything.

Cheerfulness is a tonic to self as well as to others. It's not a bit harder to force one's self to be cheerful than it is to force down a dose of some nasty medicine—not nearly so hard after it has been tried once or twice, and yet good results are more certain in the first instance than in the second.

I know a solicitor who says that he averages 8 orders from every ten people he calls on. He goes into offices which are barred to most solicitors. But he says he never crawls into a man's presence expecting to be kicked. He goes in like a man, with all the assurance in the world, and yet without appearing cheeky. He approaches people as though he had good news for them—as though he were showing them a favor. He makes them feel that they will be really better off if they have the article he is canvassing for. He says that a great many of the men most difficult to approach not only buy what he has to sell, but shake hands with him heartily when he leaves, and wish him success.

It is natural to believe in men who show that they believe in themselves, and who are enthusiastic. Dead-in-earnestness is a tremendous asset. If you want to get a man's attention and to interest him, look him straight in the eye with a firm and cheerful face, with assurance, and tell him what you want in the briefest, most forcible and manly way. This will make a good impression.

But if you flounder about as if you are not quite certain of yourself, and do not quite believe in the story you are telling or the thing you are selling, you will not carry conviction. You must first interest a man and then convince him. If you do not interest him, no matter how strong your argument, you will not convince him.

The sneak, the fawner, the apologist creates an unfavorable impression immediately, and the busy man wants to get rid of him as soon as possible—for he is the guy who helps to prolong depression.

TIRE ROTATION

By Robert A. Chandler



BY changing his tires around in the manner shown in the diagrams a motorist can make them last far beyond the usual mileage. This is done by reducing the strain on the tires as they wear away so that the newest tire is placed at the point of greatest stress and the oldest one at the point where the strain is least.

It is evident, even to a casual observer, that the rear tires wear out more rapidly than the front ones. This is due to the strain caused by transmitting the driving power through the rear wheels and other causes, such as letting in the clutch suddenly, applying the brakes, use of chains, skidding, and so on.

Now comparing the right side of the car with the left, the tires on the right wheels will wear faster. The left wheels run along the smoother part of the road where the ridges and ruts are all beaten down by the traffic. But near the edge the road is rough, there are more ruts and small stones and sometimes these wheels must leave the road altogether. Besides this there is additional weight on these wheels because the car is tipped more to that side on account of the crown of the road. Therefore it may be stated as a general principle that the rear tires wear more than the front ones and the right ones more than the left. Referring to the illustrations, No. 1 tire wears the most, No. 2 next, and No. 4 least.

Starting with all new tires it will be evident that No. 1 will show serious wear long before No. 4 has got over its newness. At this point the two should be exchanged. It is difficult to state just when this change should take place: possibly it is best left to the discretion of the driver.

If a "non-skid" tire is used the change should be made before the tread is worn so smooth as to lose its protective features. At the same time Nos. 2 and 3 should be exchanged to keep matters even.

After a few thousand miles more we enter the second phase, shown at Fig. 2. One by one the tires will wear out and not even vulcanizing can save them. They must then be moved up in the sequence shown. Supposing No. 4 is discarded, No. 3 takes its place, No. 2 moves forward to the right front wheel and No. 1 moves over to the left as shown. The spare tire is placed on No. 1, the right rear wheel as this is the point of greatest strain and should be occupied by the strongest tire.

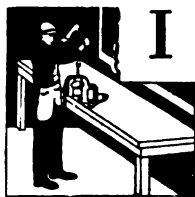
Of course, if some tire is to be removed temporarily for repairs it will be replaced by the spare tire instead of moving the rest forward and, as soon as returned, it is to be put back in its regular position.

By following the above system your tires will not only last longer but you will have less trouble from punctures,—another good reason for following this practice.

After all, it is not so much what we do, but what we get done.

Case Hardening of Steel

Seger Cones and "Sentinel" Pyrometers



I PROPOSE now to deal with Seger cones and a similar thing known as "Sentinel" pyrometers. These consist of small pyramids or cones which are tall, relatively to the base. One or more selected cones are stood on their bases at advantageous points in the heating compartment of the furnace.

The purpose is to provide a means of knowing the moment when the furnace reaches a selected temperature.

Suppose, for example, that it is desired to know when a certain part of the heating compartment got up to 1800° F. A Seger cone or a "Sentinel" pyrometer is set up at the point when it is desired to test the heat of the furnace. One is selected which has been made with this particular temperature in view. The cone will stand upright until near the time the desired heat has been reached. Then it may begin to droop or sag, or bend halfway between top and bottom. After a little experience the operator will learn just the way they may be expected to behave.

The cones are made of materials such that they will melt or crumple at whatever temperature the user may desire. That is, each cone has its own individual melting or crumpling point, and may be used for that particular temperature. It is understood that one may purchase cones for as many as 60 different temperatures, running from 1095° to 3720° F. (= *dark red* on up to *white* and beyond). I would urge the reader who expects to do case-hardening to provide himself with cones of a reliable make and learn how to use them to tell just how his furnace is doing inside in the heating compartment. Perhaps the most useful grade of cone for him to have on hand is the grade which will melt or crumple at

1830° F.

This corresponds to *full yellow*, and is a temperature at which it is suitable to do a large amount of impregnating with carbon. It is neither the lowest nor the highest heat. If the reader makes use of this grade, he may make pretty good guesses at the lower and higher heats. Thus, if a fresh cone put into the furnace crumples or melts only after a period of time, then he may feel pretty confident that the furnace is just about at 1830° F. If, however, the furnace causes a cone just put in to crumple or melt very quickly, then he may feel sure his furnace is better than 1830°. And if the cone refuses to crumple or melt but only bends over a little, he may feel more or less confident that the furnace is not as hot as 1830°, but that it is not so far short.

Naturally, the better thing to do is to have all three heats in mind and provide a different grade of cone for each. Thus, the following will give him an idea of the matter:

1560° F. = moderately low heat

1830° F. = medium heat

2010° F. = high heat

If he will get cones for all of these and use them upon occasion, he will have a pretty satisfactory way of determining how things are going in his furnace.

Copper and Brass

Pure copper melts at just about the temperature required for *fast* case-hardening. That is, it melts at about 1976° F. This is pretty close to 2010°. So, then, a piece of pure copper in the form of a wire or a strip from a sheet may be used to determine whether the furnace has the required high temperature. A bit of the wire or strip may be placed on a fire-brick and the latter put right up against the box containing the case-hardening work. As the furnace is heated up, this bit, or several bits, on the brick will soften and at last melt. To tell whether the furnace is going higher, a wire or strip may be introduced and the behavior of the hot end observed.

If the reader thinks he would prefer this method, he could use copper for the *high heat* and silver for the *medium heat*. Silver really melts some degrees below, but the proper heat can be fairly well determined by noting the behavior of the hot end of a wire introduced into the furnace. The reader may think silver is pretty expensive. But, let him observe, the silver will not be burnt up or otherwise consumed. All he has to do is to so manage matters as to save it all.

I do not know just what single metal to suggest for the *low heat*. If the reader is willing to go to the trouble to make an alloy, he can readily enough provide himself with the proper thing. I give a number of suitable combinations and the corresponding melting temperatures.

Lead 1 part, silver 4 parts..... 1544° F.

Aluminum 9 parts, iron 1 part..... 1580° F.

It is not especially hard to make up brasses of all three of the required kinds. Thus:

Copper 4 parts, zinc 1 part—medium heat 1823° F.

Copper-zinc, half and half—low heat..... 1616° F.

It should now be pretty clear to the reader that there are ways by means of which he can at not too much trouble or expense provide himself with proper means of determining the required temperatures pretty well. In fact, simple copper, used skilfully, will probably be sufficient.

Colors

There is still another way. That is to say, we may use simply a steel rod, and judge the several temperatures by the colors. I will set down here the three temperatures and the proper colors.

Light red = 1560° F. = moderately low heat

Full yellow = 1830° F. = medium heat

Very light yellow = 2010° F. = high heat

So, then, all we have to do is to provide ourselves with a log steel rod and introduce it so into the heating compartment of the furnace that its inner end will acquire the temperature that we wish to note. Upon quickly withdrawing the rod and observing the color *in a dark place*, we can get a good line on the temperature. Note, however, that the color should be observed in a place ordinarily dark. That is, the place should be dark until the end of the rod is introduced into it. This place should not only be dark, but it should be very close to the furnace. Otherwise, there will be loss of temperature while the rod is being taken from the furnace to the place of observation:

Preventing Impregnation at Desired Points

It will often be desirable to have a very hard shell at certain places on an article, but to have the other parts soft. It may be necessary to have certain parts soft, because otherwise they would break off because of the brittleness. Sometimes, it is for other reasons. It is easy enough to keep the center soft. All we need do is select a soft steel for the article. When the exterior has been impregnated with a good deal of carbon, the central part will remain just as it was. When the article is heated to the proper point and then suddenly quenched in water, this central steel will not be affected much. That is, it will not get much hardening effect.

But the case is quite different when soft places are wanted on the outside even after the article has been reheated and quenched.

Or, it may be that certain locations are desired with a lesser shell than the general surface; or, with a shell not so thoroughly impregnated with carbon.

Asbestos fiber may be used to protect parts when it is desired not to case harden at all or to diminish the impregnation. However, there are certain packing materials which generate carbonizing gases in such way that asbestos fiber is insufficient as a complete protector, especially at high temperatures. An example of such a packing material is our old friend No. 4, consisting of 6 parts pulverized wood charcoal and 4 parts barium carbonate.

In the case of such a packing material as No. 4, one may substitute *fire-clay* for the asbestos. The fire-clay is to be mixed with a small amount of water in order to make a paste. This paste is to be rather thick and is to be spread over the places where protection against impregnation is sought. All this is to be done, naturally, before the articles are packed in the box.

There are certain objections, even to this protector.

One of these objections centers on the difficulty of making the fire-clay paste cling to the work throughout the whole heating operation. It is apt to flake off. Then, sometimes, the fire-clay may be quite porous. It seems that one kind of a fire-clay may be porous, and another will be much less porous. Naturally, the porous kinds will be apt to cause trouble. Then, there are thin cracks which are the result of the high heats. Such cracks combined with a porous condition would mean still greater trouble. Under some conditions—as, where the variety of fire-clay is porous—the protection afforded against impregnation may be a good deal less than enough.

It is fortunate, then, that it is possible to improve matters somewhat by the use of *graphite*. The graphite is not depended upon to act by itself, but is employed as an assistant. With the fire-clay, a little graphite may be mixed. This is understood to reduce the “shrinking” when heat is being applied. This is thought to reduce the number and extent of the fine cracks mentioned before.

If the shape of the piece of steel constituting the work is of such a character that the fire-clay paste will not stay in place, then it may be advisable to use a metallic frame of some kind. We may have to use our ingenuity here. Steel wires of heavy section and strips and bands of steel may be found useful, when it is desired to rig a framework round the fire clay to keep it in place.

One investigator, Grenet, has recommended the use of putty as a means of preventing impregnation.

There is still another method of protection. This has the advantage of certainty. A complete protection may be gotten by leaving on the work a sufficient amount of metal, at the time the work is being cut originally. For example, suppose we wish to make a case-hardened article of cylindrical form. Part of the cylindrical surface we want to be ultimately in a very hard condition, on the exterior. The other parts we want soft on the exterior. Now, if we leave an extra 1/16 or 3/32 inch of excess metal on all surfaces wanted soft, this heavy covering of metal will act as a protector, protecting the *under surface* from being impregnated with carbon. This excess metal is left on all through the case-hardening process. When the article comes out of the box at the end of the impregnating period, this excess layer will be impregnated like all the rest of the surface. The work is now allowed to cool off. Then it is put back on the turning lathe and the excess metal taken off in the usual way. The article is then heated up to a proper point for hardening and quenched in water (or perhaps oil). The locations where the excess metal has been removed will be comparatively unaffected by the heating and quenching, and so remain soft. The other portions of the surface, since they have been impregnated with carbon until a high percentage occurs in the external shell, will become hard, just as a tool steel would become hard when thus heated and quenched.

The objections to this method include such adverse considerations as (1) the cost of putting the work through so many operations, and (2) the difficulty of getting the

work back on the machine-tool for the purpose of cutting off the excess metal. This latter objection will be considerably reduced in such cases as those in which the work was originally cut between centers on a turning lathe. Putting such work back on the lathe may be a comparatively simple procedure.

If the work is of cylindrical shape and at least one end is free, still another procedure is at times applicable. That is to say, a piece of tubing of the proper size *inside* is shrunk onto the surface where no carbon impregnation is wanted. The work with this tubular sheath on it is then put through the carbonizing process in the usual way. The whole may be hardened in the usual manner. The protective shell is then broken off. In order to put the tubular shell in place, it is first heated up, say, to 750° F. The idea is to increase the diameter of the shell and then make it big enough to put it over the cylindrical part of the work that is to be protected against carbon.

A very simple method is sometimes applicable with work of the form of gear wheels. Thus, if a number of such wheels of precisely the same size are to be hardened on the toothed periphery alone, one may simply pile one gear wheel on another to make a pile in the shape of a column. The sides or faces of the gears being in contact one with another will protect each other more or less satisfactorily. Naturally, however, there will be a top gear and a bottom gear. The reader is advised, in case he wishes to use this method, to match the teeth or not match them, in accordance with his desire to have the ends of the teeth protected or not. When I speak of matching the teeth, I refer to the moment when the pile of gear wheels is being constructed.

Liquid and Semi-Liquid Carburizing Materials

Some attention has already been given to the use of *potassium cyanide*. This is properly a liquid carburizing material, because it is in the liquid condition when it produces its results. There are other substances or mixtures of substances that may be used in the liquid condition. That is, the work may be simply *immersed* in the molten carburizing material. Let me quote from Giolitti at this point: "Many other fusible carburizing mixtures have been proposed for use in place of the potassium cyanide in cementation (case-hardening) *by immersion*; but as far as I have personally been able to determine, I believe that none of these presents any advantages over potassium cyanide."

Potassium ferrocyanide in powder form may be used as a means of producing a very thin coating of high-carbon steel. Notice the letter "o" in "ferrocyanide." When the letter at this point is "o," the thing that potassium ferrocyanide means is a *yellow* substance. In fact, potassium ferrocyanide is another name for yellow prussiate of potash. However, if the letter "o" is changed to the letter "i," then we get potassium ferricyanide. This is the same as red prussiate of potash.

(To be continued next month)

"HAVE A CLEAN ENGINE BOTH INSIDE AND OUT FOR BEST RESULTS"

By Ronald L. Prindle



THE engine of the automobile is a steady and willing worker if kept fairly clean both inside and out. Internally, this refers to cleaning out carbon when necessary, as well as to cleaning and refilling the crank-case occasionally to avoid the expense of the troubles which have their beginning in the accumulations of sediment or water in the engine base.

On the outside there is usually considerable oil spread over the castings which catches dust of the roads and soon coats over completely. At the various couplings which drive the magneto, water pump, etc., dirt collects to start wear. However, the clean engine is apt to receive better care because the driver finds it a pleasure to work about it, while the defects are easily detected if kept clean especially at important places such as crank-case nuts, where cylinders are bolted to the crank case, or the cylinder head studs.

This problem is solved by scrubbing, as often as necessary, with a stiff brush and kerosene to cut old grease and carry away grit which is the greatest enemy of the working parts. Mop up the excess kerosene with cotton waste until dry. Serious break-downs are common where grease and dirt have cast a dirty dull grey over the engine and covered a multitude of mechanical disarrangements.

There is less danger of fire if the engine is kept free from oil and grease because there will be nothing to feed a fire should a tongue of flame shoot out of the carburetor. Avoid getting gasoline or kerosene on the electrical apparatus as it will do much harm; and when cleaning the engine stay in the open air as a safeguard against fire.

It is further understood that the engine is not to be started again until the fumes have evaporated. Clean engines do the most work at least cost, dependence can be placed at all times, other things being equal.

AN OMISSION

In an article entitled "The Ford Cut-Out" which appeared in our August issue, page 33, we published an illustration showing this Cut-Out and its mounting. Through error we neglected stating that this illustration was used by courtesy of the American Bureau of Engineering.

The shades of night were falling fast,

He stepped on the throttle and hurried past,

A crash in the darkness—the man was dead.

What did they find when they opened his head?

Excelsior.

—Boston Transcript.

To Attract Christmas Trade



A Store Window Background.

Christmas trade is worth bidding for these days inasmuch as all Automobile Accessories have now taken their proper place on the Christmas gift list. This background may be painted on a curtain to roll up or be pulled down

at will. Any good sign man will do the work at small cost. Any advantage to be gained by superior methods is indispensable to complete success. Start early—get your order to your sign man now—don't wait.

REASON AND REMEDY FOR MUFFLER EXPLOSIONS

By L. R. Prindle

MANY a good muffler has been shattered through the explosion of gasoline vapor within it. In practically every instance this is due to the ignition failing for some reason to properly fire the explosive charge in the cylinder, the most common being failure of the spark plug. Yet all spark plugs that fail will not produce muffler explosions, but if these explosions do occur in the muffler it is almost certain that the spark does not jump regularly between the points of the plug.

Be sure that the distance between them is not greater than the thickness of a smooth dime or piece of thick tin, this adjustment being correct for nearly every make of automobile. In order to cause the muffler explosion it is necessary for a combustible charge to pass along into the exhaust pipe.

A second cause is a detached secondary wire from the spark plug, burned out coil, over-rich mixture from carburetor, valves badly carbonized or sticking, weak spark from a dirty magneto, spark improperly timed, and circuit breaker sticking. Thus this explosive mixture which is delivered into the exhaust pipe is at once followed by a flaming hot exhaust discharge from a succeeding cylinder, and of such intense heat to set fire to the combustible charge which proceeds it.

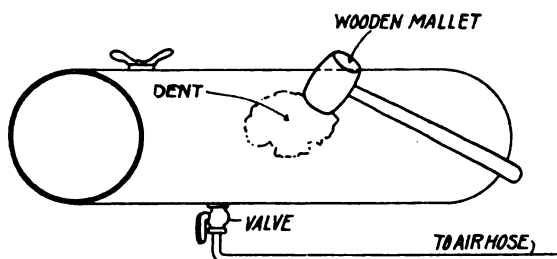
Correctly speaking, the explosion itself actually takes place in the exhaust pipe instead of the muffler, and the term "muffler explosion" is due to the fact that noise is heard by the ear from the tail pipe of the muffler.

Removing the foot from the accelerator while the car is moving swiftly on the road results in explosions of this kind, as will also a retarded spark with open throttle when the charge is burning so slowly that the ignition flame travels back when the exhaust valves open. A good operator has the spark lever advanced as far as possible without causing the engine to knock.

REMOVING DENT FROM GASOLINE TANK

By A. L. Prindle

THE removal of dents from the gasoline tank is so difficult that many motorists are inclined to allow them to remain. In the removal of such dents plug the vent in the filler cap, after which fill the tank with water



and apply twenty pound air pressure.

A lead or wood mallet is used by tapping gently around outer edge of the dent.

ENGINE CARBONIZATION

By V. P. Rizer

THE average car owner of to-day, who drove cars ten or a dozen years ago is impressed by one outstanding feature of all modern engines, their wonderful ability to accumulate carbon. Cars were not so ten years ago, the carbon evil was not a black monster, only a quiet and unassuming little imp who could be whipped into oblivion by giving him a scraping once each year. But to-day, that imp has grown until he fills the cylinders every few hundred miles.

And what has caused this lusty growth of the black infant? Surely the engines of to-day are better than those of the past. Yes, that is true, the engines are seldom at fault. Lubricants are no poorer than they were a dozen years ago. This is also true, but the trouble is not due, on the average, to poor lubricants or inefficient engines, it is the carburetor which is at fault, the stomach of the engine which feeds the black imp who is now a fat devil of harm.

There are two kinds of carbon, oil and fuel. Oil carbon is spongy and soft, usually moist while fuel carbon is glass hard and sticks like enamel. Either of these carbons serve to form binders for still another substance, dirt.

If the pistons and rings are properly fitted and there are no scores or deep scratches in the cylinders, one should have no trouble from oil carbon but the other carbon is not an easy monster to conquer.

Conditions ten or a dozen years ago were absolutely different from what they are to-day as far as the automobile is concerned. To-day the fuel is rich in all of the elements which go to make carbon and poor in all of the volatile matter so necessary to give the quick, snappy explosions necessary for operating a gas engine. The best carburetor in the world does not vaporize, completely, all of fuel which passes through it. Even if it did, the fuel would condense in the manifold or the cylinders and the result would be a slow burning, carbon forming mixture.

This is one of the chief reasons why carbon forms rapidly in modern engines and the second reason is the large amount of dirt in the air which is sucked in through the carburetor. Carbon formed from un-carbureted fuel might be burned or blown out through the exhaust to a large extent were it not for the dirt.

It is fairly safe to say that a car would run twice as far without carbon trouble were it not for the dust in the intake air. For this reason it is advisable for every car owner to consider some form of cleaning apparatus for the intake.

The writer has tried out a very simple scheme which seems to be of great help in removing some of the dirt which normally might get into the cylinders. Steel wool, the stuff which is sold for removing varnish from wood and metal surfaces, comes packed in paper tubes about eight inches long. Remove about half of the steel wool and pull the rest of the wool out to fill the whole length of the tube. Slip the tube over the carburetor intake and

fasten it so that it will not be lost. When this is done it forms an excellent air filter. The wool is rough and still enough so that it will not mat down or cut off too much air. If it is found that the device does choke down the carburetor too much, put the wool into a larger tube. An engine fitted with one of these air filters and some kind of a water vaporizing device will run twice or thrice as great a distance without requiring the carbon removal as one not so equipped.

REPAIRING AXLE HOUSINGS

By Donald Hampson

THE full floating axle housing terminates in a thread for the retaining nut. When these threads get stripped, as they sometimes do, it is an open question whether the best thing to do is to get a new housing, try to re-thread the old one, or batter over the end so the nut cannot come off and "let her go." No one nearer than the axle manufacturing people has a die to fit the end and if the garage man had one from the factory it wouldn't do him any good for it would be a machine die and he would have no way to use it.

Usually, these housings terminate in pieces of steel tubing that are about three inches in diameter where they rivet into the stamped or cast bridge and are swaged down to about two inches where the wheel runs. Tubing is apt to be pretty soft steel and it is not made any tougher by the process of drawing down the end—it is this end that is threaded, its softness is partly responsible for the original threads going bad, and this quality makes it worse to re-thread than if it were harder material.

Re-threading has to be done in a lathe. But even after every piece that isn't riveted is taken off, the housing is a mean thing to work with; one end must be chucked and the other end steady-rested, dodging around the brake support flange and just getting a hold far enough back so there is room to work a long, springy thread tool over the damaged section. The entire set up is unsatisfactory.

A steady rest is a poor support for a piece under the strain of a cutting tool and a cutting tool that overhangs the tool post takes up all the slack in the various carriage joints before it begins to cut and then—bang!—it rips out one or two threads before you realize what has happened and manage to get the lathe stopped.

The writer has seen these housings ruined in attempting to re-cut the threads—not through any fault of the workmen either, for the conditions are all against turning out a good job. If everything were nice and stiff, half a dozen cuts over a damaged thread would do but as things usually are, twenty or thirty of the finest skims are required and then there is always the risk of tearing up the thread by a wee bit too much feed.

One way that is often satisfactory is to make a die for the thread. An old gear, for instance, may be soft-

ened, threaded like the axle end but a little smaller, about six flutes filed in it, and then hardened again.

This can be made in from one to two hours. It saves putting the axle in the lathe and the fussing around that accompanies. Then the die is run over the thread, using *plenty* of lard oil and hitching back and forth as it progresses. This will not be a high class job but it will usually be better than the lathe job and show a thread stout enough to satisfy the owner.

A new nut can be threaded up to fit the under size axle end, making it a "wrench-tight" fit and working it on with oil. The reasons why the factory can get a good thread on this material while the outsider cannot may be explained in this way: the factory studies the job and finds by experiment what form of threading tool will work best, then they make up such tools and keep them in first class condition, using them in a specially built machine if necessary. The factory then gets hold of the axle before there are so many appendages in the way of properly supporting it under a cut.

REPAIR TO TOOL POST

By Chas. H. Willey

THIS idea may come handy to someone who meets the problem of having a broken tool post on a large lathe. I had one break as shown in Fig. 1, and after annealing it, I cut it off and made a dog or finger, as shown in Fig. 2.

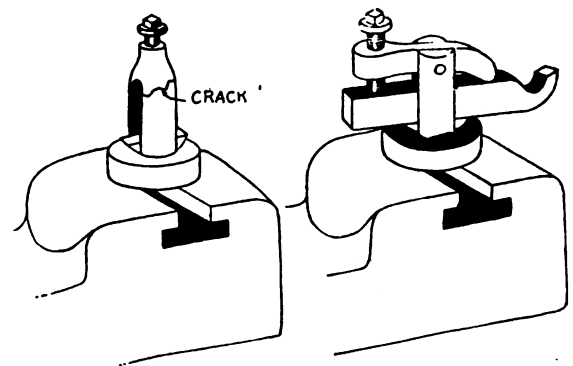


Fig. 1 at Left Showing Broken Tool Post. Fig. 2 at Right Showing How It Was Repaired.

This worked all right and was a much quicker repair than a new tool post, though a new one was later obtained in order to have the full tool space. The idea could be used to advantage when making a tool post for any lathe for it holds the tool rigid.

HAD ONE AT HOME

Singleton—"They have machines now that can tell when a man is lying. Ever seen one?"

Wedmore—"Seen one? By gosh. I married one."
—*Boston Transcript.*

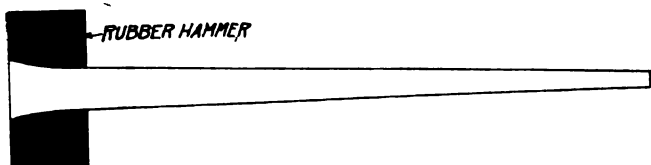
HOW TO PUT A HANDLE IN A RUBBER MALLET

Copyright 1921 by W. F. Schaphorst

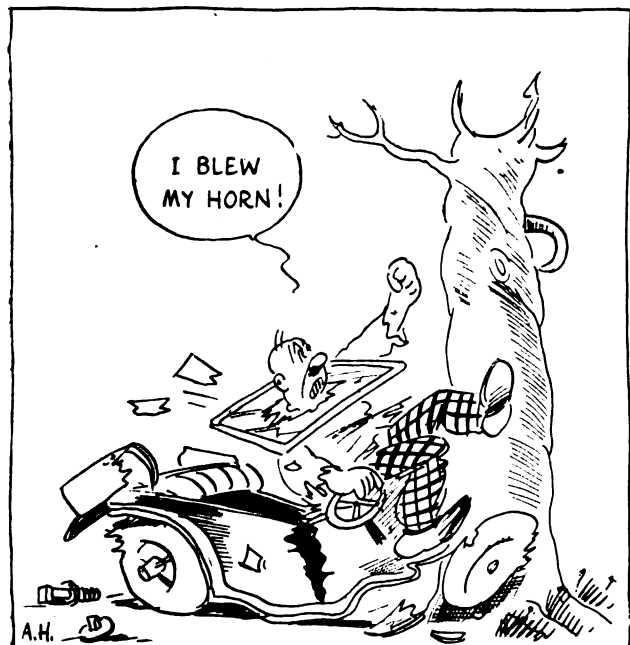
RUBBER mallets or hammers are very useful for hammering delicate metal parts that must not be scratched or that must not be battered. Every mechanic should have a rubber hammer handy.

One of the objections to the ordinarily made rubber hammer, however, is that it easily "flies off the handle." The ordinary rubber hammer cannot be wedged like a metal hammer because the wedges simply stretch the hammer and the head is liable to fly off through the window at any time.

To overcome this objection a friend of mine has hit upon the method of using a handle similar to those used



in earth picks—the ordinary pick. Those handles are large at the head end and are inserted into the head by slipping the handle end in first. In this way the danger of flying off is overcome. The sketch herewith shows how it is accomplished.



This goes to show that blowing your horn won't always clear the road

LEAVE OFF THE PAN? WHY NOT?

WHY not leave off the pan?" Some one asks frequently. There are no pans on Fords and countless other cars and they get along as well. In fact, a car without a pan is a safer fire risk than one so equipped. Dirt and grit, pieces of waste and odds and ends collect in the pan and get oil soaked—gasoline drips on the accumulation and when a backfire occurs, the material is right there, placed, for a neat little conflagration. So keep your pans scrupulously clean.

But everyone who takes off a pan and puts it back alone will swear that it is a back-breaking job—and they don't see why pans can't be left off. They could be but more dust would come up around the engine and electrical machinery. Then too, most cars with pans have more attachments on the side, well down, that should be kept reasonably clean for inspection or adjustment. The pan could be left off if a substitute were provided to close up the gaps between the engine and the side frames.

Some owners have made good substitutes by making trough shaped pieces of light sheet metal with a flange along both top edges—one flange to rest on the inside of the frame and the other notched out to catch under two of the crank case bolts; these pieces protect the engine attachments as well as a big pan, they are light, and may be easily removed if so desired.

AUTOMOBILES AND THE WIRELESS

WITH an ever increasing number of broadcasting stations sprinkled liberally throughout the country we can look forward to many things, amusement, instruction and general information. The station at Newark is sending out not only music but weather forecasts, stock reports, position of incoming ships, baseball scores, news items, jokes, stories and music. But why is it not a practicable proposition to broadcast road conditions in cases where main thoroughfares are closed?

Each broadcasting station might be informed by the road commissioners in that particular territory when a main road is closed. Doubtless this sort of information would be of far more interest to a larger proportion of the people than a report of the ships at sea, or even stock reports, because the stock broker as well as those who might be interested in the quotations, knows the figures at the closing of the market, hours before they are announced by radio.

Such a proposition would undoubtedly save the motor-ing public many hours of time and worry, for the detour is the bane of the motorist's existence.

(It would seem to be a proper time to work for some such cooperation on the part of road authorities as mentioned above. Our readers are invited to write us their views and to suggest ways of accomplishing the desired purpose—Editor.)

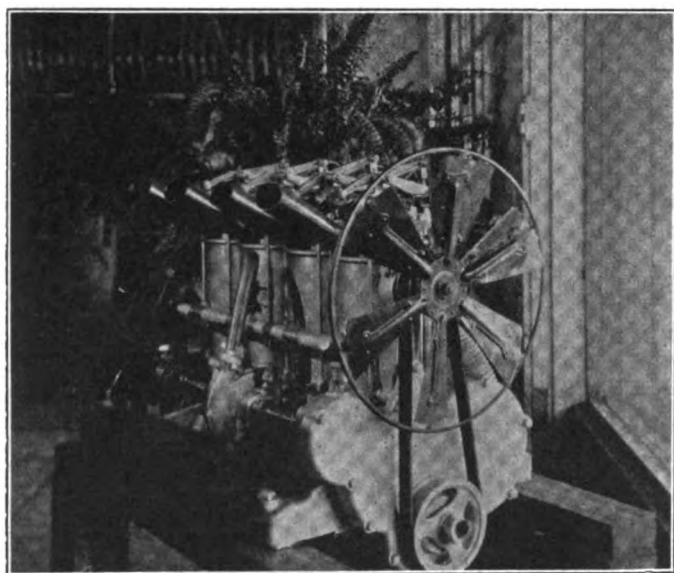
AIRPLANE ENGINE CONVERTED TO FAST AUTO MOTOR

By Ruel McDaniel

AN eight-cylinder aviation engine has been converted into a sturdy automobile motor by a lieutenant of the Naval Air Service at Pensacola, Florida. The engine at a glance appears as though the original aviation motor might have been cut in half fore and aft, for only the right bank of cylinders is utilized in the construction of the new type engine.

When the powerplant is placed in a racing type of automobile body, it is expected to pull the car along at the rate of a hundred miles an hour or more. Its weight is less than 300 pounds; it develops 62 horse-power at 2000 r. p. m., and has a maximum of 2600 revolutions. The original aviation engine with its eight cylinders was good for 100 h. p. at 1400 r. p. m.

The new motor is said to combine the high volumetric qualities of the aviation engine with the stability, strength and freedom from vibration of the best types of automobile engines. A special feature is that the connecting rods form a thermal bridge for heat passing down from the pistons, which is dissipated into oil in the crank case, resulting in an increase of temperature of about 20 degrees in the oil.



Converted Airplane Engine

By means of crank case aspiration the residual volatiles in the lubricating oil thus thrown off are drawn through the carburetor and burned in the combustion charge. This, it is claimed, also affords a means of keeping a partial vacuum in the crank case when the engine is running, eliminating crank case leakage and vapor discharge from the crank case breather. Thus fuel consumption is greatly decreased and the engine is kept clear.

The bore of the cylinders is $4\frac{1}{2}$ inch, the stroke 5 inches. A velocity water circulation is maintained from an impeller type pump. Two spark plugs are used on

each cylinder, and the cylinders are fitted singly, making accessibility very simple. In fact a complete cylinder can be replaced with ordinary tools in less than one hour.

The oiling system is a combination of high pressure and splash, so designed that if one fails the other does the work. The cam followers and guides are operated under positive oil pressure, the surplus falling off and oiling faces of cams. The engine is equipped with Master racing carburetor, and Bosch magneto for ignition.

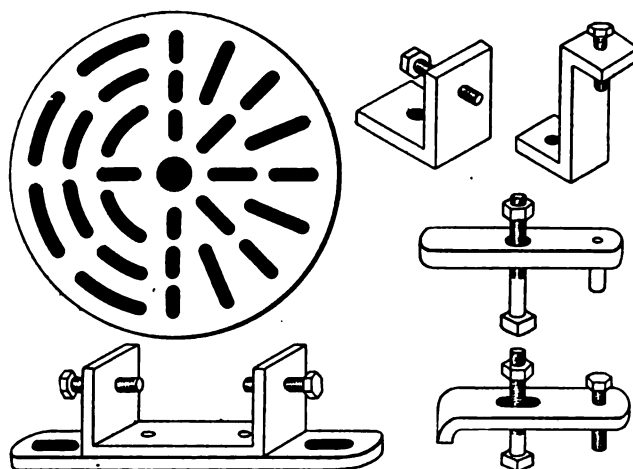
The entire engine is aluminum with the exception of the cylinder liners, cam shaft and valves.

The motor was made during the officer's spare time, with practically no cost, the original motor being one the government had discarded as being of no further service for aviation purposes.

LATHE TOOLS

By Charles H. Willey

A FEW tools for use on the lathe face plate are shown in the sketches. They are all easily constructed by the shop's mechanics and aid greatly in holding and securing various kinds of work. To any mechanic familiar with lathe work their value is readily seen.



In one shop the writer found a face plate with radial bolt slots as shown in Fig. 1. This plate permitted the securing of work in the best possible manner for a bolt could be put just where it was needed.

THEY CAME BACK

"When I was a little child," the sergeant sweetly addressed his men at the end of an exhaustive hour of drill, "I had a set of wooden soldiers. There was a poor little boy in the neighborhood and after I had been to Sunday school one day and listened to a stirring talk on the beauties of charities, I was softened enough to give them to him. Then I wanted them back and cried, but my mother said, 'Don't cry, Bertie, some day you will get your wooden soldiers back.'"

"And, believe me, you lob-sided, mutton headed, goofus-brained set of rolling pins, that day has come."

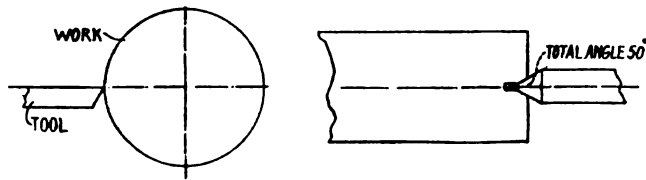
--The American Legion Weekly.

CUTTING THREAD SCREWS

By F. H. Sweet

THERE are several kinds of screw threads in use. In America, the 60-degree V-thread and the United States Standard or Sellers thread are employed, and in England, the Whitworth. Besides these are what may be called the square thread and the Briggs pipe thread. In all, the type is defined by specifying details relative to an axial section. The 60-degree V-thread is one whose axial section is a triangle, the angles of which are all 60 degrees. The U. S. section is similar, only the tops of the threads and bottoms of grooves are rounded. The Briggs thread increases or decreases in diameter in passing from thread to thread. The thread is otherwise somewhat similar to the Whitworth, only the triangle is equiangular and the roundings are on a much smaller radius or curvature.

The cutting edges of the cutting tool which may be used to form any of the usual non-tapered threads is properly shaped to the exact form and size of the axial section desired at the finish. That is, the flat horizontal surface of the nose of the tool should have the required



form and size. The nose should also be so shaped that as the top is ground down from time to time for the purpose of sharpening the tool, the form and size of the thread section will be maintained.

This shaping of the nose may be very accurately done at the beginning, before the tool goes into action. A gauge may be made of a piece of thin sheet steel by cutting a notch of the precise size and form of the thread wanted. When grinding the nose of the tool on the front and on the sides, this gauge may be used to test the work from time to time. The top surface of the nose is properly made flat and parallel to the top and bottom surfaces of the shank. The object in view is to be present to the work a cutting edge that is horizontal. If the parallelism is not provided, then we may expect the tool to cut a groove too narrow or too wide.

If exact results are wanted, too much care can hardly be given to the grinding of the nose. Once ground to size and form, the regrindings should be comparatively simple, as all it is necessary to do is to maintain flatness and parallelism with the shank. The size and form of the section will then be right.

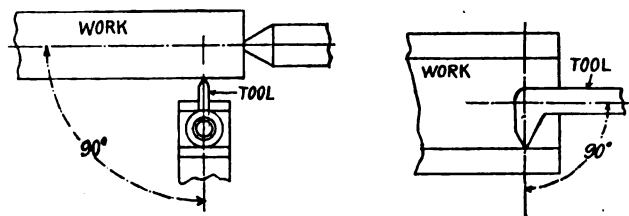
Now when the tool is set, it is very important that it be horizontal and that the top surface of the nose be at the exact level of the axis of the work. If this requirement is disregarded, then we may expect the thread to be wrong. Thus, if the top of the thread is to have a 60-degree angle and we set the tool too high or too low,

then we will not get 60 degrees but something different.

If the question is asked, "How is one to make sure he has the cutting edge at the exact level of the axis?" the following answer may be made: Put the centers in the headstock and tailstock of the lathe. Then bring the tool up close to each and note whether it is in agreement with the level of the points of the centers. There is still another requirement. The axis of the cutting edge and the axis of the shank should be exactly parallel. When the tool is set, these axes must be perpendicular to the axis of the work.

In order to cut the winding groove on the work, it is necessary that the tool shall move along parallel to the axis of the work while the latter is rotating. In fact, there must be a very exact correspondence between the forward or backward shift of the tool and the rotation of the work. This shifting of the tool is ordinarily secured by means of the lead screw of the lathe. We put the carriage which supports the tool and tool post into the control of the lead screw. When the lead screw turns around once, the carriage and tool will be shifted exactly the amount of the pitch of the lead screw.

That is to say, for example, if the lead screw has six threads to the inch, then the pitch will be exactly one-sixth inch. Suppose, now, that when the work turns around once, the lead screw also turns around once. Then, we should have the tool advancing or receding one-sixth inch with every turn of the work. In fact, we should cut a thread of exactly the same pitch as that of the lead screw. But, if the work rotates faster than the lead screw, the tool will be shifted too slowly to cut a thread of the same pitch. We should get a thread of a somewhat different pitch. Similarly, if the work rotates more slowly than the lead screw, the tool will shift too rapidly to cut a thread of six convolutions to the inch. We will get a coarser pitch, which means a smaller number of threads to the inch.



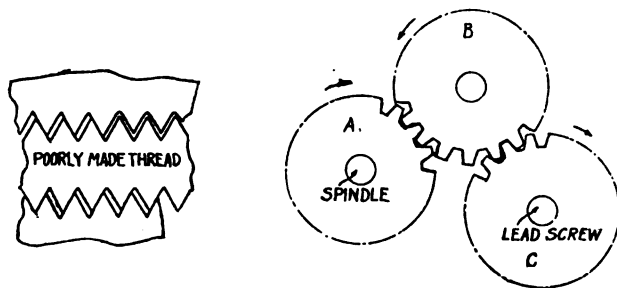
It is possible to regulate the rotation of the lead screw relatively to the spindle of the lathe and get just about any pitch on the work that we desire. If we want twelve threads to the inch, then we must make the lead screw turn half as fast as the work or spindle; if we want three threads to the inch, then we must adjust the lead screw to rotate twice as rapidly as the work.

The lead screw is usually driven by the spindle through gear wheels. It is not especially difficult to learn how the gears control the pitch of the screw thread we cut, and which gears to use in order to get a certain pitch that may be desired. Let me explain a simple case. Let A be a gear wheel on the spindle; C one on the lead

screw; and B an intermediate gear. First, consider B. It serves to keep the direction of rotation alike between spindle and lead screw. If the spindle gear A rotates *with* the hands of a clock, then the lead screw gear C will also rotate with the hands; and *vice versa*. Second, the number of teeth on B plays no part in the relative speeds of A and C. For example, suppose A and C have, respectively, 32 and 28 teeth, then a complete rotation of A will produce one one-seventh rotations of C. It will make no difference whether B has ten or forty teeth. Consequently, any figuring we have to do will not need to take the intermediate gear into consideration. It simply serves to keep the rotation directions of A and C the same.

Now suppose we want to cut ten threads to the inch and that our lead screw has six threads to the inch. What we must do is to select proper gears for spindle and lead screw to give us ten turns of the spindle while we get six turns of the lead screw. The gear A will be the smaller one. Further, the two gears must have numbers of their teeth such that these numbers will be in the ratio 6:10.

If one has eighteen teeth and the other thirty, that will cover the case, or, if one should have twenty-four



and the other forty. In fact, it doesn't matter what the numbers themselves are, just so that they have the right ratio, 6:10. Then we put the smaller one on the spindle and the larger one on the lead screw. It may be helpful to recollect that the slower the lead screw turns, the finer the thread will be.

Take another case. Suppose we want to cut a coarse thread five turns to the inch. This is coarser than the thread on the lead screw itself. Consequently, we want the lead screw to turn more rapidly than the spindle or the work. This means the smaller gear must go on the lead screw. All that remains to do is to select gears for lead screw and spindle that are in the ratio five to six, put the bigger one on the spindle and the smaller one on the lead screw; and select an intermediate gear to make it possible for the one to drive the other. Gears having ten and twelve teeth, fifteen and eighteen, twenty and twenty-five, twenty-five and thirty, etc., are all suitable.

If the lead screw has a right hand thread, an intermediate gear, or some equivalent, will be needed when we want to cut a right hand thread. However, a right hand lead screw and no intermediate gear, or else two of them, will cut a left hand thread. A right hand thread is cut by advancing from right to left, and a left hand thread by advancing in the opposite direction.

The work may be held on the lathe between centers or it may be held by chuck. In general, work carried between centers may be cut more accurately than if the chuck carries it. This is due largely or entirely to the double support. It is a good rule when working with a chuck on the headstock never to take the work out between the beginning and end of all turning operations. This would apply to cutting screw threads. In fact, it would probably be quite difficult, if not impossible, to cut a reasonably perfect thread, if the work were disturbed when half done.

Before cutting a thread between centers, it may be advisable to make sure that the centers themselves are right. The point of a center should be exactly on the axis of the center. The levels of the two centers must be exactly alike.

To test this, the screw cutting tool may be set in the tool post and the carriage run to one center and then to the other for the purpose of setting the tool for height at one and of testing the other center for agreement with this level. It may not be out of place here to say a few words about centers. The work turns about the tailstock center. It is advisable, then, to prepare the hole in the work at the tailstock and so that the point of the center and the metal of the work will not be in actual contact. This may be done by first preparing a conical hole to fit the center and then counterboring it at the bottom with a small drill. This drill hole, if deep enough, tends to prevent damage to the center point either by wear or by friction. It is well to counterbore the other end of the work also.

If an interior thread is to be cut, we will naturally have to use a tool somewhat different from the plain straight tool for cutting exterior threads. A suitable tool for a considerable range of work is one with a right-angle bend in it near the nose end. We are then able to move the tool back and forth in the hole. Aside from the bend, the tool may be precisely the same as the one already described. It is very essential that the flat top of the nose shall be set at the exact level of the axis of the work and that the axis of the flat top be exactly at right angles with the axis of the shank. This latter requirement is the one, perhaps, that will make the most difficulty. It will be well to have a substantial shank so that the stress of cutting will be well resisted. This resistance may be increased, also, by shortening the distance from the bend to the point where the tool holder grasps the shank.

Whether we cut an interior or exterior thread, the tool will naturally wear. This wear should be confined to the edge of the top. To sharpen the tool and perhaps better its shape, we must regrind it on the top surface of the nose. The final surface should be exactly parallel with the top and bottom surfaces of the shank. Naturally, a reground tool will not have its cutting edge at the proper level, but below it, unless we take special measures for correcting the level. This we may often do

(Continued on page 41)

Making a Year Round Profit

Winter Overhauling Offers Opportunity To Make Dull Season a Busy One

Many garage and repair shop owners, during the busy and profitable summer and fall months, fail to give due thought to the approaching winter and its accompanying dull period in the workshop. It is this annual winter loss that takes the heart out of so many repair shop owners and causes their bank balance to shrink to dismayingly figures. When it is so evident that many shops with efficient equipment are in a position to overcome this condition, it is really pathetic to witness such a needless state of affairs.

There was never a time when there was so much of overhauling and rebuilding work to be done; never so many cars in need of overhauling and rebuilding, not to mention the trucks and tractors that offer in themselves an untold amount of work. It must be remembered also that people are continuing to practice the strictist economy. They are not buying new cars, nor are they knowingly running their old ones in a dilapidated and wasteful condition. If they are properly approached they are quick to see the advantage and economy of a complete and thorough overhauling.

Here is a plan that has been worked to mighty good advantage by a number of repair men.

Instructions are given the shop-foreman to check and report on a separate card the general condition of each motor that he works on. Whether he simply cleans out the carbon or opens up the motor for any other purpose he measures the cylinders with a micrometer and records the exact size, wear and taper of each. He also makes notes of any scores or blemishes of any kind and determines whether valves or topjets are in bad condition; makes notes of the condition of the clutch, gear sets, rear axles, etc., and notes any particularly loose bearings or noisy operations.

So when Mr. Jones in the fall of the year drives up for gas the garageman glances at his card and has plenty of ammunition with which to tackle him on securing a complete *winter overhauling* job. He goes out and engages Mr. Jones in conversation about as follows:

Garageman: "Good morning, Mr. Jones. How many today?"

Mr. Jones: "Oh give me about ten and a quart of oil."

Garageman: "She sure is getting to be an old gas eater, isn't she? You remember the time you had her in here last spring to grind the valves? The cylinders were six to eight thousandths out of round then and she must be quite a little more now the way she sounds. Besides the bearings are quite loose and there are a lot of other things that need to be checked up. What you want to do, Mr. Jones, is to let us enter your order for a winter overhauling job.

Bring it in at the time you are ready to lay it up. Let us go through the old boat thoroughly and rebuild it completely and we can make her as good as new and she will run on half the gas and half the oil you are using now."

Mr. Jones: "That is not a bad idea. I will bring her in later."

Garageman: "About what time do you think you can bring her in? You see we are going into this winter overhauling and rebuilding heavy and in order to avoid any confusion later in the winter we are entering the orders as we get them so we can plan our work more intelligently. By having the actual orders we know just how many jobs we have to do and we can plan our work and stock much better. We could likely get at yours about Christmas time. Could you bring it in about that time?"

Mr. Jones is pretty apt to say, "I guess that will be all right," and allow the written order to be entered.

Sometimes the garageman must use a little more salesmanship than this. He can point out how much the customer is losing by running his car in bad condition. He must picture how inconvenient it would be to have the car break down during the busy spring and summer months. He can call the customer's attention to the fact that he can do the work better and cheaper during the winter,—better because he can give it his own personal attention, and because they are not rushed with other work as at other seasons of the year and can give it their undivided attention and continue uninterrupted. This would naturally make it cheaper because of the greater efficiency.

Neither the time nor space is as valuable in winter as it is during the rushed summer months. Any repairman having space that can be partitioned off to give a small sufficiently heated shop and having a reasonable amount of good up to date equipment can go into this business and can make more money than he is doing in the rushed summer months. But it takes backbone and solicitation.

An average winter overhauling or complete rebuilding job will run from \$40.00 to \$250.00 depending on the make of car and the amount of work done but these jobs must be solicited just the same as you would solicit the sale of a car.

YEARS OF DISCRETION

"I asked you to send me young lettuce."

"Yes, ma'am. Wasn't it young you got?"

"Young? It's almost old enough to wash and dress itself." —*Boston Transcript*.

Automobile Dealer and Repairer

A Mechanical Motor Magazine

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M. T. RICHARDSON
President and Treasurer

F. R. WHITTEN
Secretary

M. T. RICHARDSON, Editor
GEORGE H. WILSON, Managing Editor

F. R. WHITTEN, Advertising Manager

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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

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Boosting Repair Shop Business

UNDERSTANDING the need for up-to-date and progressive methods of doing business, and the advantage of first class equipment in the repair shops of the country, a number of manufacturers have started a campaign designed to present to garage and repairmen the value of modern equipment. This is a move in the right direction, as we feel sure our readers will agree.

Some of you may look upon this work of the manufacturers as a mere scheme to sell their wares, and so it may be, but indications are that a great deal of help and information is being extended that is of particular value to the wide-awake individual who is looking for ways to boost his own business.

Of course there are many plans for advertising and business promotion that are unavailable for the small garage, largely due to prohibitive costs. However, there are methods that any garage man, with the exercise of ordinary common sense, can adapt to his own ends and profit thereby.

There are so many ways for the live garage and repair shop to build and develop business, that lack of capital is no longer an excuse for slack times. Right in your own shop may be found means for producing more and new business. Next month we are going to print the story of one unusually successful shop. This story

is fraught with pertinent suggestions of value to all garage owners and repair shop men. If it proves interesting and helpful to you, we will be glad to have you tell us about it.

Order as a Garage Asset

NEATNESS in arrangement and the value of orderly methods are too often overlooked and entirely neglected by public garage and repair shop proprietors.

A disorderly, cluttered up, junk-heap sort of garage may thrive for a time, by force of special circumstances; but in the long run success for such an establishment is a sheer impossibility.

Make it your rule, Mr. Garage man, to have "a place for everything and everything in its place" and enforce this rule strictly with all employees.

If your car owner customers perceive that you have a dirty, slovenly, ill-kept place of business they may not say anything about it to hurt your feelings, but they are bound to "take notice" and sooner or later they will withdraw their patronage and transfer it to some live, up-to-date competitor, who realizes the importance of keeping up a decent appearance and the general breaking down of morale which is sure to result in the junk-heap type of garage or repair shop.

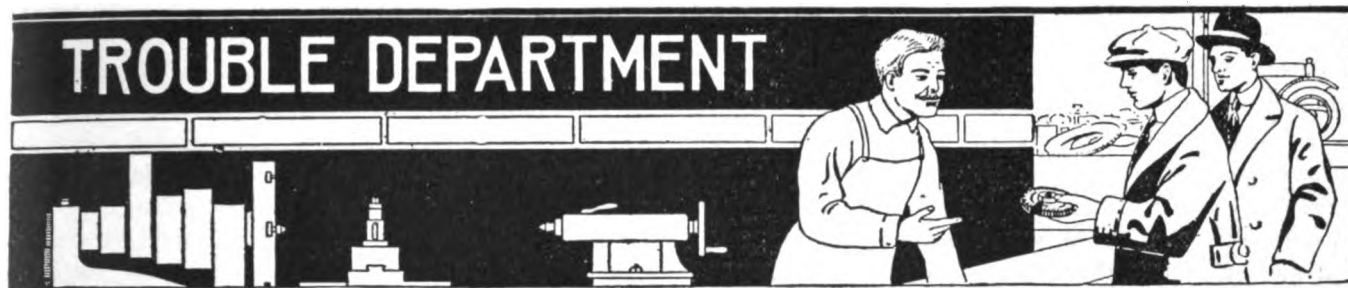
If a customer pays for service, give him the clean, good sort of service to which he is entitled, and when he enters your place let him feel that he need not be ashamed of his surroundings.

This matter of neatness and order may be difficult of attainment and it may seem of trifling importance, but it is one of the greatest assets in any business and it may mean all the difference between success and miserable failure.

Usefulness

One of the best things that can be said of any man is that he has lived a useful life. This is equally true of magazines. The question uppermost in the minds of all publishers should be—"How can we best serve our readers." Your editor is endeavoring to answer this question for himself, and he wants your help. Frankly, he wants an expression of opinion from our readers. He would specially like to know just what you have found most interesting and useful in this magazine! What suggestions you have to make, if any, as to how he can make our columns still more interesting and useful?

If there are certain kinds of stories or articles that you would like to see printed, or particular information or facts that you think we should print, write us your views. We are going to make every effort to produce just the kind of magazine you want and with your aid are sure that we will succeed in making this a most useful publication for all of our readers.



Weak Ford Magneto

3148

From R. S. Hepburn, Pennsylvania:—I have a 1916 Ford car which has been giving me considerable trouble of late. When I turn on the head lights, which are wired to the magneto, the engine commences to skip and has no power. What is your advice in this matter?

Reply:—It is evident that the magneto does not generate enough current to operate both the lights and the ignition system. You have a choice of using batteries for ignition or repair the magneto.

The probable trouble with the magneto is caused by weakened magnets and if you can have the magnets re-magnetized, then the trouble will be cured. We would advise you to take the matter up with your repair man and see if he can do this work at a reasonable price. Many shops, which make a specialty of Ford work, are equipped with mageto re-charging devices and can do the work at a reasonable figure.

If you cannot find a shop which has proper re-magnetizing equipment, then it is advisable for you to have a new set of magnets installed. Of course all of this work depends upon the present condition of the car and it would not be advisable to spend a lot of money on the job if you can foresee the necessity of junking or selling the car in the near future.

A set of six or eight dry cells will probably last for one season and you can never be sure of results from them. If the car runs all right except when the lights are on, then you can use the magneto for ignition during the day and the batteries only at night.

Master Vibrator Installation

3149

From Albert A. Mellen, Illinois:—Will you please give me some pointers regarding the "master vibrator" installation on a Ford car? I would like to know if such an installation is really worth the price and whether such an installation will really save gas and prevent trouble.

Reply:—We feel entirely right in recommending the installation of a master vibrator device on any Ford car because there are so many points in its favor with practically no arguments, except price, against it. The cost is so small and the benefits derived are so great that the price should be no objection.

The present, four coil system used on the Ford car was long ago discarded by the manufacturers who were in search of a more "fool proof" system of ignition. If

the coils function properly, then there can be no objection to the four coil system. As a general rule the coils work well enough and the average owner has no comparison to go by.

The very basic theory of gasoline engine operation depends upon ignition. In a multi-cylinder machine full efficiency is obtainable only when all cylinders work in unison, or in "synchronism" as the engineers term it.

To illustrate this point. Suppose that the most efficient point, in the piston stroke, for ignition, is $\frac{1}{8}$ of an inch before top center with the engine running at a certain speed. Assuming that the timer is properly designed and made, it is possible to set the spark so that it is properly timed for one of the cylinders. Now supposing that the four vibrators, in the four coils, all function differently, With this condition it is impossible for each cylinder to receive the spark at the proper time and only one can be timed properly.

Coil windings and connections can be made fairly uniform, but the adjustment of the four vibrators will vary as will the strength or springiness of the arms or vibrator tongues.

When a master vibrator is used, however, only one vibrator is in action, so that if the timer is properly made the four cylinders will be synchronized insofar as the spark is concerned.

The connections for the master vibrator are easily made. Current passes from the magneto to the master vibrator, then to the bar at the bottom of the regular Ford coils. From the bar the current runs to the coil which happens to be grounded through the timer at that time. All vibrator adjustments on the four coils are shorted or screwed down so as to throw them out of action.

Timing an Old Engine

3150

From Roy L. Cohen, New Jersey:—I have an old Maxwell engine which I purchased with the idea of putting it into condition to run a small shop. When I bought it the thing was fairly well pulled down, timing gears off, and all small parts were thrown helter-skelter in a box. There are no marks on the timing gears or on the flywheel so that I don't know the firing order or how to time either the valves or the ignition.

Will you kindly tell me how to time the engine? If you have any suggestions which will help me in putting the thing in condition I will appreciate it.

Reply:—Since we do not know what model engine you

have we cannot give any accurate data upon it but you can doubtless get it to running with our directions and then make such modifications in the timing as may seem necessary from the action of the engine.

The first thing to find is the firing order and for this purpose you will need the camshaft and tappets in place. Turn the camshaft in its proper direction of rotation, (counter clockwise) and watch one set of tappets. It is a good plan to put some little red or white stickers on the exhaust valves, for instance, so that you can watch them more easily. The two outside and the two inside valves are the exhaust. The exhaust valves will open in the firing order which will be either 1-2-4-3 or 1-3-4-2, probably the latter.

The next thing to do is to adjust the valve stem-tappet clearance which should be .004 of an inch. This clearance can be measured with a feeler gauge of the proper thickness.

Next turn the crankshaft over until the piston in number one cylinder has traveled to the top of its stroke and down $1/32$ of an inch. Put a thin piece of paper between the tappet and valve of number one intake and turn the camshaft in its proper direction, (counter clockwise) until the paper is gripped by the tappet and valve.

At this point drive on the timing gears so that they will mesh properly. If you have followed directions you will find that the intake valves open when the piston has traveled downward between $1/32$ and $1/16$ of an inch.

This valve setting may be wrong, but it is fairly near the proper one. To check it off, put the paper between the exhaust valve stem and its tapper (number one cylinder) and turn the crankshaft until the exhaust valve has opened and closed. Stop turning the second that the paper is released, indicating the closing of the exhaust valve. If the piston has traveled over top center, then the timing is as near correct as you can get it for the time being.

But if the exhaust valve should close before top center, then turn the camshaft backward (clockwise) one gear tooth. The idea is to have the exhaust valve close after top center and the intake to open shortly after the exhaust closes.

After the engine has been in operation for a time you can tell by its action whether the valve timing is correct or not. If the engine overheats, then the exhaust valve is probably closing too early and the camshaft can be given a one more tooth backward turn.

In timing the ignition turn the crankshaft until piston number one has reached the top of its compression stroke, when both valves will be closed. Turn it just enough further to be sure that the crank pin has passed by the top center and then set the ignition head.

In setting the ignition head, turn the ignition unit driving shaft, or the magneto shaft, until the breaker points start to open, then mesh the gears or tighten the coupling. Find under which distributor point the distributor brush is located and connect this point with the spark plug in number one cylinder. Connect the other plugs with the

distributor points, in the direction in which the distributor brush rotates.

Before assembling the engine be sure to weigh all of the piston-connecting rod assemblies. See that they are all of exactly the same weight. The heavier pistons may be reduced in weight by boring small holes just above the bottom ring in the skirt of the piston.

For cooling you may use a large barrel, so mounted that bottom of the barrel comes level with the lowest part of the water jacket. Remember that the engine will need considerable more cooling water than when it is used in the automobile.

We would advise you to install a vacuum system and place the main fuel supply tank lower than the carburetor. This will protect the machine in case of fire.

Battery Becomes Overcharged

3151

From G. H. Walters, New Jersey:—I do considerable day driving and but little during the night, consequently my battery is always fully charged. The ammeter averages to show a charge of 10 amperes while the car is running and I have been advised to cut down on the charging rate. Would you advise me to do this? Or do you think that the low charging rate will not keep the battery in condition?

Reply:—In our last month's magazine we gave a suggestion for the alleviation of high charging rates; we would advise you to read that article.

Where most of the driving is done in the daylight it is advisable to have a low charging rate, in fact it is advisable to have just as low a rate as possible, still keeping the battery charged. We would suggest that you try lowering the rate to around two or three amperes and keep track of the battery for a while. High charging rates tend to overheat the plates and cause shedding.

As low a charging rate as $\frac{1}{2}$ an ampere is permissible and in fact it is at about this rate that batteries are kept in storage, at the battery stations, during the winter months.

Water Jacket Leakage

3152

From Roy A. Spellman, Kentucky:—I have a 1921 Essex car and recently removed the cylinder head to grind the valves and remove the carbon. After replacing the head and tightening the bolts I noticed that water tended to leak from beneath the head of one of the bolts. No matter how tight the bolt may be, the water leaks through just the same.

As the matter now stands I don't dare put any more pressure on the bolt head, nor do I want to take off the whole head again and fix the gasket if it can be avoided. I am obliged to put water in the radiator twice a day. Can you give me a suggestion?

Reply:—Your trouble is caused by a dent in the gasket or a scratch on either the cylinder top or cylinder head and unless you replace the gasket with a new one you will always have a certain amount of trouble.

For the time being, however, it is unnecessary to replace the gasket. Remove the bolt, around which the water leaks, and give it a thick coating of flake graphite and oil. Mix up a teaspoonful or so of graphite with oil to the consistency of heavy cup grease. Use this for coating the bolt.

Then take a piece of heavy, soft, cotton twine and wipe it into the graphite-oil stuff until it is thickly coated with the graphite. Wind the string about three times around the bolt, just beneath the head and put the bolt back again.

The string will make a fairly tight packing and is protected by the graphite so that it cannot burn. Of course the bolt can never be screwed down as tightly as the others, but if only one bolt is bothersome there is little danger that the gasket will be blown out. If there were several leaks, then we would advise you to replace the gasket with a new one.

For the benefit of you and our other readers we might suggest that, in the future, when you install a cylinder head gasket, be sure to coat it on both sides with the above mentioned mixture of graphite and oil.

Valve Stem Leakage

3153

From Henry M. Butterworth, Massachusetts:—My Chevrolet, 490 car recently has caused some trouble, a noticeable lack of power and a failure to throttle down when idling. No carburetor adjustment that I could make, seemed to remedy the situation so I took off the head and ground the valves as well as removed the carbon. But the trouble still exists.

When I had the valves out I noticed that shoulders were worn on the valve stems near to the head as well as on the stem end. Do you think that these shoulders prevent the proper working of the valve?

Reply:—We do not think that the shoulders, in themselves, are the direct cause of your trouble; but we do think that the shoulders indicate where the trouble lies.

Originally the valve stems were perfectly round and straight and fitted the valve stem guides. After long usage the stems have become worn and naturally they cannot fit. It is also probable that there is some wear in the valve guides. You can figure that the amount of wear is equal to three times the depth of the shoulders.

Under these conditions considerable air leaks past the valve stems and dilutes as well as condenses the ingoing mixture. Naturally the engine cannot give either its full power or even action under this condition.

Welding Aluminum Parts

3154

From Prospect Garage, Illinois:—In our shop we are often called upon for aluminum welding jobs. Hereto-

fore we have been sending them out despite the fact that we have an oxy-acetylene welding outfit. But our men cannot seem to weld aluminum without burning it. They get along allright with cast iron but when it comes to aluminum they cannot seem to control the temperature or hold the parts properly.

The shop to which we send the work seems to have no trouble and they can take a crankshaft, for instance, that has been broken into half a dozen pieces, put them back and make a fairly smooth job of it. Can you give us a few tips relative to this work?

Reply:—The reason you have had so much trouble with aluminum welding work as contrasted with that of cast iron, is the peculiar absorption of heat quality which aluminum has. Aluminum is an excellent conductor of heat.

To show the peculiar conductivity of this metal pour a little boiling water in the bottom of an aluminum utensil. Within a few seconds the upper edges of the dish will be heated and within a short time the whole dish will be about the same temperature.

Heat will travel many times faster in aluminum than in iron or steel, consequently when you heat one part of an aluminum casting to a point where it will weld, the whole casting is apt to collapse.

In welding aluminum it is preferable to use small torch tips so as to concentrate the heat rather than to distribute it. The preparation of the work is of far more importance than the actual welding and if you observe a few rules, prepare the part properly and take as little time as possible in the actual welding or melting operation you will succeed.

Suppose, for instance, you have a job of crankcase welding. The bottom of the case has been punched through and the break covers a surface of six inches square.

In preparing the case, as in cast iron welding, be sure to clean it thoroughly. Special aluminum fluxes and welding rods are obtainable from any welding supply house.

Make up a fair sized box of sheet metal, approximately 36 inches square and fill it with clean, dry sand, sifted. This sand will glaze over with heat and form a firm support for all broken pieces. Put the case upon this sand box and fit in all of the small pieces so as to make the job complete; then you can work with reasonable certainty that there is no place for the parts to fall.

Build a dam of moist sand around the portion to be welded and bank the sand around the housing as much as possible to absorb the heat.

Where it is necessary to make small welds and the parts are missing you can form a mold of plaster of paris to conform with the finished job and melt the welding rod into it.

Where large parts are to be welded it is advisable to "frame" them up with iron supports as much as possible. A strip of iron on each side of the crankcase to be welded, supported at each end so as to carry most of the weight, is advisable.

Work Shop Experience Prize Contest

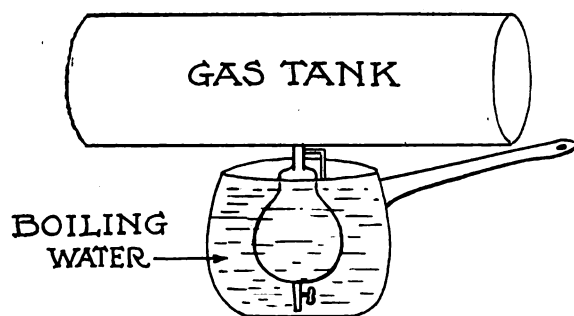
Open to All Readers—Full Details Are Printed On Page Two

[Here are some of the letters received for our Work-shop Experience Prize Contest. If you haven't sent in yours yet, do it today. Your letters will help to make this magazine more interesting to our readers as well as bring you opportunity to share in the rewards offered for the most interesting and practical article submitted.—Editor.]

Thawing Frozen Sediment Bulb

In cold weather, failure of gasoline to reach carburetor of Ford car is frequently due to ice in sediment bulb under gasoline tank. The presence of ice in sediment bulb is easily ascertained by opening drain cock on the bottom of sediment bulb and running a wire up through as far as possible. Failure to get the wire through is an almost certain indication of ice.

A safe and very speedy way to thaw the bulb is as follows:



Disconnect feed pipe at bulb and procure about one-half gallon of boiling water in a stew pan or other deep vessel and raise up under bulb until it is immersed. After about two minutes gasoline will overflow the vessel. The accompanying sketch illustrates the process described.

C. C. KOON, Ark.

Repairing Cracked Waterjackets

I repair cracked waterjackets by simple soldering as follows:

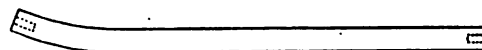
The surface around the crack for at least $\frac{1}{2}$ inch each side of the crack must be thoroughly cleaned by filing the surface smooth and bright. With a heavy soldering iron cover the entire brightened surface with a coating of $\frac{1}{2}$ & $\frac{1}{2}$ solder. Now cut strip of brass wire strainer screen to fit over surface coated with solder and with hot iron press this screen into the coating of solder. Now fill the screen with more solder and you have a strong

permanent job. For soldering flux I use muriate of zink.

J. A. ARRISON, Montana.

Tool for Replacing Pins in Valve Stems

With the little tool illustrated below it will be found possible to eliminate a great deal of the difficulty sometimes experienced in trying to insert the pins with the fingers. Such a tool should prove an aid in any repair shop and a time saver as well.



To make this tool all that is necessary is a short piece of round iron rod (about 7 inches). Drill a hole in each end that is slightly larger in diameter than the pins. These holes should be drilled to a depth equal to about one-third the length of the pin and the pin should fit in loosely. The object of the curved end is to make it unnecessary to turn the valve stem, should the hole be turned to one side.

H. J. CORBIN, New York.

Replacing Broken Fly Wheel Cogs

In your August issue I noted your recommendations about replacing cogs broken from the fly-wheel. I have had the same trouble in my car and used the following remedy with excellent results.

The car was tipped on its side, then with an electric drill holes were drilled in the fly-wheel where teeth were broken, using a drill several thousandths larger than the top cross diameter of the broken cogs, drilling from one to three holes for each tooth, according to the extent of breakage.

Next cut from a steel rod about .003 larger than the drill, a peg for each hole, tapering one end of each slightly. Then drive the pegs in as far as possible, file off the sides and top to conform to pitch and size of the original cogs.

Since then my garage man has treated other cars in the same manner with perfectly satisfactory results, one Overland 6 having over 70 pegs put in, while my own car has been driven two years with no signs of the inserted pegs giving out.

O. P. BROWN, Mass.

NEW YORK State has put into effect one excellent law of the road. That is the law that requires drivers of all busses to stop, look, and listen before crossing any railroad. It is distressing enough when a car is struck by a train but when a bus with its load of helpless ones packed inside is struck, the accident is awful in the extreme. Unquestionably, the fault has rested with the bus driver but railroads have had to pay out millions in damages for such accidents.

Now there is a law which makes it a misdemeanor to approach a railroad crossing in a reckless manner and railroad officials are going to see that responsibility is placed where it belongs; to that end, many railroads are going to the expense of stationing checkers at crossings to get data on buses that do stop as required. Offenders will get a chance to think it over in court.

It is a good law. The railroads are out to see it obeyed, to protect themselves. But in so doing they are going to confer an immeasurable blessing on humanity. It is a good deal like the situation in the industrial field: formerly we had factory inspection and regulation but the best an employer could do with his workmen in regard to guards, their removal, and general protective devices was coercion or discharging an otherwise capable man—the employer had no weapon to fight with. Now, under the compulsory insurance law, the employer pays a high premium but the matter of protection is largely out of his hands and a man who does not make use of the safety devices is subject to court action as well as being broadcasted, so to speak, by the insurance companies as a careless man in case he seeks employment elsewhere.

HE came in a Ford sedan, with a Reo Six crankshaft lashed to the running board. His business card read

Royal Auto Garage and Taxi Service
Fallsburg, N. Y.

Licensed Mechanics Guaranteed Supplies

He was on his way to New York City and wanted to have the shaft straightened and ready for him when he came back. While he waited, we determined that the main journals were round and all but two of the pins and that there was a decided bend in the shaft. Apparently, the Royal Taxi Service had temporarily suspended and the party was to do the big town in the Ford while the Reo was being fixed up.

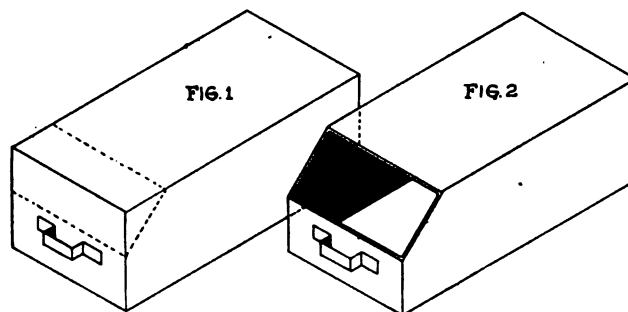
"Do you guarantee your work?" asked the manager. "No," was our reply, "we do the best work we can with good men and ample facilities regardless of whether it is an automobile or a steam shovel. We will get the shaft closer than .002" straight or you don't have to pay for it.

"And, by the way, you could save some expense by having your man round up those two pins—it's a hand operation with us and you can do it the same way." But he protested that their man couldn't do it right. We did not argue, we were willing to do the job, but we could not help wondering at the new one—the "licensed" mechanic—and what the monster was like.

USE FOR EMPTY GALLON TINS

By Charles H. Willey

THERE are from time to time many empty gallon oil tins of the familiar rectangular shape shown in Fig. 1 collecting around the shop. By cutting these



diagonally across the corners as shown in Fig. 2 and arranging them in an improvised cabinet, as shown in

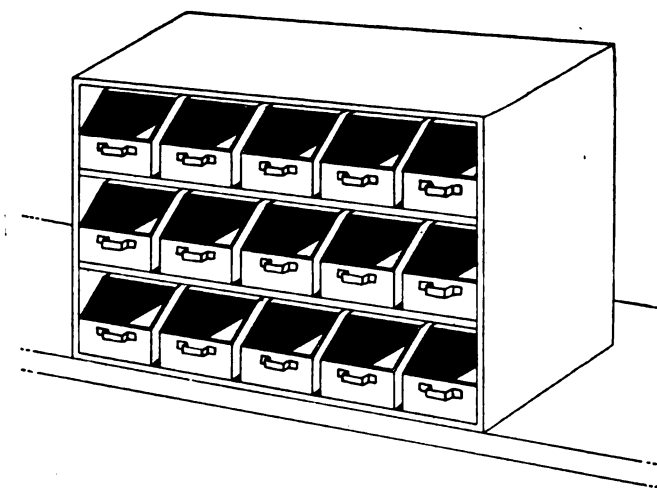


Fig. 3, they provide a handy place for various small parts, supplies, etc.

The contents of each is visible, thus making it unnecessary to label them.

HAVE YOU TRIED THIS?

CARS that have a pan under the engine shut off a good deal of light from accessories located down along the side of the crank case such as pumps, cocks, filler connections, etc. A garage that is otherwise light enough is too dark for one to do the best work on parts between the pan and engine. Artificial light must be used, even if for no more particular job than noting when the oil in the crank case begins to run out of the upper-level pet cock.

Artificial lights are mean to handle and when there is only about a fifty-fifty need for one, numerous people go without and trust to luck.

The dark portions mentioned may be lightened up sufficiently by the simple expedient of placing a piece of white paper or newspaper in the pan. The effect is unbelievable until tried out. This is an adaptation of the trick long practiced in machine shops where lathe hands slip a piece of paper under their work to give a light background.

A PRIMING CUP FOR THE INTAKE MANIFOLD AND ITS MANY USES

By Robert A. Chandler



A RIGHT-ANGLED priming cup set at the fork of the inlet manifold will be found to be one of the most useful fittings on the car. It is seriously needed on a Ford engine but it will be found extremely useful on others. If a dash control is added, as shown, its utility is very much increased.

The thread is the standard $\frac{1}{8}$ inch pipe, for which a $\frac{5}{16}$ inch drill should be used. These may be obtained in any hardware store or machine shop. Buy a priming cup with a flat handle so that a hole can be drilled in it for the rod from the dash. This rod should be bent at right angles and kept from falling out by a split pin.

The greatest utility of this fitting is in removing carbon. Water is poured in slowly while the engine is running. The gas lever will have to be advanced slightly, the distance being found by trial. Water admitted in this manner turns to steam, blowing the carbon out with the exhaust. If the car is equipped with a muffler cut-out, tie this open so that the water and carbon will not accumulate in the muffler. Place a piece of newspaper below the cut-out, and you will marvel at the amount of carbon removed.

Some drivers prefer to use peroxide of hydrogen, on the theory that the extra oxygen combines with the soot, burning to carbon monoxide or dioxide, and so assisting the process. A quart of this liquid run through the engine is certainly less expensive than removing the head and scraping by hand, besides taking much less time.

On account of its convenience it can be done frequently, whereas if the carbon must be removed by hand there is a tendency to put off the process of scraping until the cylinders are badly choked. Alcohol is favored by other drivers and is to be used in the same way. Either denatured or wood alcohol can be used, the choice depending on whichever is the cheaper in your locality.

On no account use kerosene for this purpose. Some misguided drivers use it and point to the heavy smoke issuing from the exhaust as evidence of carbon being removed. But this smoke will be produced from a perfectly clean engine, as it is merely unburned kerosene. Consider a minute. Your carburetor is still feeding a mixture of gasoline to the engine that is very nearly correct.

If kerosene is added, there is not enough oxygen left to absorb or burn all of it, so it is charred, making a heavy smoke of unconsumed carbon. Naturally this heavy smoke will add to the layer of carbon already in the cylinders. Possibly it will remove some of the carbon, but it will also leave some. Does it seem reasonable to use a carbon remover which also causes carbon?

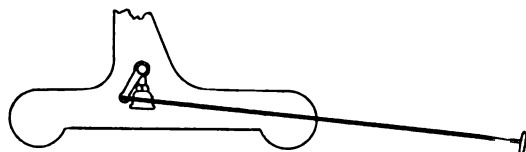
Undoubtedly kerosene can be used to remove carbon, or at least to reduce the incrustation if it is not too hard, but this is done by leaving it in the cylinders over night

so that it has a chance to do its work. The engine must be hot and about half a cupful of kerosene is poured into each cylinder through the pet cocks or spark plug holes. The engine is then given a couple of turns with the starter so that the compression will force the heavy kerosene vapor into the carbon.

It is then left until morning so that the vapor can have a chance to act. It works its way into the deposit, softening it so that it falls as dust or burns more readily. The next morning the engine is run as usual, it not being necessary to remove the kerosene as it burns up and passes away by itself.

This process is far different from the one above described where it is fed through the priming cup on the inlet manifold. Passing through the engine it has very little time to act on the carbon but, as stated, makes a smoke which only adds to the carbon already there.

Another use for our priming cup is to assist in starting the engine, especially in winter or even on a cold, damp morning in summer. Gasoline may be fed while the



engine is cranked. The Ford carburetor has a pool of gasoline especially made for aiding in starting, and the choke valve controlled by the wire through the radiator undoubtedly assists, but what is needed is a spray of gasoline that will evaporate quickly.

As a liquid running down the side of the manifold gives a greater surface than the pool, much better carburetion results. If the valve of the priming cup is only opened part way, so as to allow the gasoline to enter slowly, and the engine is cranked at the same time, atmospheric pressure will force it in as a spray, making evaporation much more certain.

Finally our device can be used to give a little more air to the mixture and so develop more power with greater economy of gasoline. The only adjustment to the Ford carburetor is on the spray nozzle, the air valve (where it is used) being entirely automatic and not subject to control.

The driver changes the adjustment of the spray nozzle from time to time until he finds the best position for level roads, and then he opens the valve about a quarter turn for hill-climbing. By experimenting with the priming-cup as an auxiliary air-valve, giving more or less gasoline from the spray nozzle, and changing the air to correspond, he will occasionally find a marked improvement.

WHITE MULE HENRY—Bill, I wancha t'be more careful. Firs' thing you know you'll have us in the ditch.

RASIN JACK BILL (in astonishment)—Me? Why I thot you was drivin'.—"The Lightning Line."

(Continued from page 32)

by simply putting a strip of thin sheet metal beneath the shank in the tool holder.

A little consideration will perhaps convince the reader that when we screw one thread into another, it is not so important that the top of one thread shall touch the bottom of the other as that the body of one thread shall fit snugly into the groove of the other. In fact, we may have the case where the top of neither thread reaches quite to the bottom of the other and still not have any noticeable defect. If the top edge of a screw thread is somewhat worn, we may not be able to tell its real diameter by measuring the over-all diameter.

It will, sometimes at least, be best to rely on what is called the *pitch diameter*. This is the average between the diameter measured from top to top of the thread and the diameter from bottom to bottom of the groove. It is really the distance from half way between top and bottom on one side, to half way between top and bottom on the other. This is a matter of some importance for the reason that it may be necessary sometimes to take off the top edges of 60-degree V-threads to prevent trouble when screwing into each other. Indeed it is a good practice both with the sharp V-thread and the U. S. Standard to cut off a trifle at the top of the thread, provided the thread is not to be case hardened.

There is the advantage that a close fit can then probably be better made than otherwise. The reason for thinking so is this: Very slight differences between the two threads will then have an opportunity for rectification, the metal having a chance to flow into the open space. That is, the two threads can force each other a trifle.

Where a good deal of work of one size has to be done, it may be well to use taps and dies. There are taps for use on a power-driven machine and taps for hand use. Similarly, with dies. In general, accurate thread cutting should not be attempted with hand operated tools. It is, for one thing, too difficult to be sure that the axis of the tool and the axis of the work are exactly in line during the operation.

We now come to the question—How are we to determine whether our threads are right or not? We may try one with the other. But this is by no means reliable. Two threads that properly fit together bear against each other throughout. Thus a nut and a bolt, when the one is screwed onto the other, should so fit round and round the thread that a strain tending to pull the nut off would be resisted by all the convolutions in engagement, and not by one or two only.

It is possible, however, for one to fit a nut and screw together without being able to tell whether there is bearing of thread against thread throughout. This is shown in one of the diagrams. Here the thread in the nut has a pitch a trifle longer than that on the screw. Yet this nut might seem to have a proper fit when tried merely by screwing it on, because of the contact of threads at the two ends. We could, if the screw thread goes further inward, test the matter of unequal pitch by trying to

screw the nut in further. If the resistance is strong—stronger than when we were simply putting the nut on—then we probably have a case of inequality in pitch.

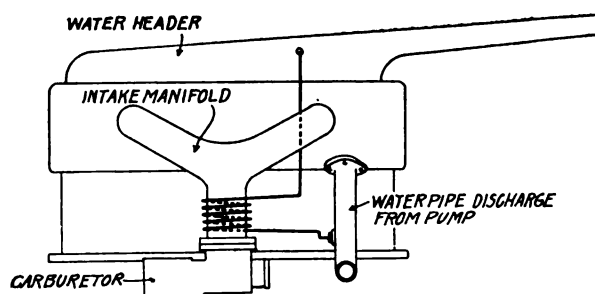
However, there is a very simple instrument by means of which we can determine whether the pitch of the screw agrees with the standard required or not. This is a short strip of thin metal, on one edge of which teeth somewhat like those of a saw, have been cut. These are really the axial sections of the grooves desired on the screw. When held so as to fit into the valleys on top of a horizontally held screw, a very minute error in pitch can be readily detected, especially if the light is back of everything. It is understood that a good gauge of this type will enable a beginner to detect a pitch error of only 0.005 inch. These gauges are not to be confused with the ordinary pitch-gauge used simply to tell whether the screw has 12 or 13 threads to the inch, or the like.

Precision pitch gauges are tested to a high degree of accuracy—one concern, at least claiming an accuracy of 0.0001 inch. They are not so applicable to interior threads. But the gauge may be applied to the tap, if one has been used to make the interior thread. If the thread has to be cut on the lathe, then we may have to depend a good deal upon the fact that we used the *same* combination of gears for screw and hole. I am speaking now about the *pitch* of the threads and not about other features.

There is a second important measurement. This is the *pitch diameter*. We must not depend upon the outside diameter nor upon the root diameter (as the diameter from bottom to bottom of the groove is called). There are *plug* and *templet* gauges for this purpose. There are also *go* and *not-go* gauges of the fork type, which are not unlike snap gauges. The pitch diameter may be measured by special *screw thread micrometers*.

SIMPLE HOT WATER JACKET

Owning a 1912 model car which was having great difficulty in digesting the present low-grade fuel we installed a hot water jacket. The sketch herewith illustrates the method of attaching the water jacket made from discarded copper tubing.



The tubing must first be softened by annealing which is accomplished by heating the tube by means of a gas torch. When cool it can be bent into any shape, after which it is wound around the manifold closely, and with suitable fittings attached, one end to water header, the other to the discharge-water pipe from the water pump.

WAR TAXES AND THE MAGAZINES LEND EAR, MR. AUTO OWNER!

THERE is a H— car “sales and service” station in our town, presided over by a mechanic “from the New York branch” and owned by a prominent automobile man. To make this recital more interesting, it might be added that any other town would serve as well and the car might be any of those in the better-than-average class.

A customer brings his car in to have some of the noise taken out of the engine and to have its lost pep restored. Diagnosis by the leading mechanic tells that the engine must be taken down, bearings tightened up all around, new wrist pins, new piston rings, and maybe new pistons. Customer attacked with a sinking feeling in pit of the stomach at the thought of how sick this job will make a hundred dollar bill but he is braced up somewhat by the comforting words that his “motor” will be good as new when the job is done.

The sales-and-service station has no tools other than a vise and an air compressor and a post drill, which necessitates sending out to have any machine work done. They believe in having work done right, so whenever any work is farmed out they send a man along to stay with the job and watch how it is done. “Yes, we have to charge for our man as well as the shop’s charge but we get better work by having some one there who knows what is right.”

That is how the H— work is handled in Joe Bell’s town—and I will say that the service station gets many a bouquet for the jobs it sends out. Joe, he works in the shop where they send their work and the Hudson people like to have him do their jobs—they even wait a day or two some times to get him instead of some other machinist. Fitting oversize pistons is the one job they insist on being done by Joe—under their mechanic’s direction.

Last week they sent in a cylinder block and six new pistons. When Joe finished up his other work, we called the H— station and Oscar, their prize mechanic, came over immediately to boss the job. Meanwhile Joe examined and measured the bores which, he had noticed at first glance, were badly worn. When Oscar arrived, Joe called his attention to the cylinders and suggested that they be ground on the heald before the pistons were fitted in but Oscar insisted that the bores were good enough and that the pistons be ground down to such a fit as he would pass upon. It was Joe’s business to give him what was wanted, which he did in about three hours’ time.

After the job was paid for and Oscar had gone, Joe came over and said, “Say, boss, I don’t like to do anything that way. I told him you couldn’t fit pistons in those bores but he practically told me I didn’t understand the business. But the engine won’t be any better now than it was before it was taken down. Every one of those cylinders is out of round three or four thousandths. More than that, the lower part of each bore is the original size, and so is a little ring at the extreme top, but from there down for six inches the diameter tapers larger, end-

ing in a shoulder at the lowest point reached by the rings. This shoulder is eight or nine thousandths bigger in diameter than the part just below it where nothing but the skirt travels.

They say that Oscar there was first violin in the service station down in New York so I tried to get him to tell me how he made a piston fit a cylinder that was all sizes from 3.500 inches to 3.509 inches and no two spots alike, but he passed it off. That car has only run 5000 miles—belongs to Mark Sayer over to Westtown—hope he never asks me about the job on those cylinders—I’ll tell him.”

There is food for thought. A good car gone wrong. Then put through an “overhauling” that would not help one bit. The customer pays, of course. Aside from the item of time, there were six pistons with rings, representing \$5.50 a piece, simply thrown away. The tightest piston rings could not hold compression in such lopsided cylinders; the shoulder at one end of the travel can be guaranteed to furnish a delightful knock; the poor car will be lucky to make 3000 miles before another overhauling.

Auto owners must face this situation. City or country, it is just the same. The plumbers who couldn’t plumb and the farmers who couldn’t farm have found a snug harbor in the automobile game—a week’s work washing cars and, behold, they blossom out as full fledged mechanics, ready to botch any job that comes into the garage.

Far be it from me to suggest anything which the State might twist into a fit subject for another bureau or department (we have already too many laws and lawyers, rules and regulations, fees and licenses) but a mechanic should be made to prove that he is competent to delve into the intricacies of an automobile before he is allowed to practice, just as a physician must prove that he is in possession of a working knowledge of the human body and its needs. The cigarette mechanic is a menace, more so than the speed maniac.

An officer was showing an old lady over the battleship. “This,” said he pointing to an inscribed plate on the deck, “is where our gallant captain fell.”

“No wonder,” replied the old lady; I nearly slipped on it myself.—“*The Lightning Line.*”

EVIL BE TO HIM, ETC.

“Sister Henderson,” said an English deacon, “you should avoid the appearance of evil.”

“Why, deacon, what do you mean?”

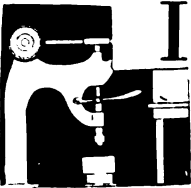
“On your sideboard you have several cutglass decanters, each half filled with what appears to be ardent spirits.”

“Why, deacon,” said the hostess, “it isn’t anything of the kind. The bottles look so pretty on the sideboard that I just filled them half-way with some floor stain and furniture polish just for appearances.”

“That’s why I’m cautioning you, sister,” replied the deacon. “Feeling a trifle weak and faint, I helped myself to a dose from the big bottle in the middle.”

CARE OF CONE CLUTCH

By F. H. Sweet



IF, AFTER considerable running, a cone clutch begins to "grab" or engage harshly, it is usually due to drying out of the leather facing. This hardening and lack of resiliency prevents it from taking hold smoothly. Dress the clutch leather with neats-foot oil, which will soften it, unless it is charred and burnt from continual slipping. The oil may be applied easily by releasing the clutch. This may be done by putting a piece of wood, of sufficient length to keep the clutch pedal depressed, between the pedal and the heel board under the seat. The oil should be applied with a spatula or table knife blade and should be distributed over the entire surface of the leather. While the clutch is held out, it will be well to turn the engine over with the self-starter to insure uniform distribution of the oil.

If the clutch is slipping, as is evidenced by the car picking up speed slowly while the engine runs at a relatively high rate of speed, the trouble is usually caused by an accumulation of lubricating oil from the spigot or thrust bearings. The easiest remedy is to absorb the oil with fuller's earth, which is applied uniformly over the leather surface while the cone is held out of engagement as previously indicated. The power is sprinkled in from a piece of tin or cardboard, though a bellows-gun such as is used for insect powder may be used to advantage.

Sometimes the clutch may slip because of lessened spring tension caused by the cone becoming inbedded in the flywheel from use. In some clutches, coil springs are used to keep the cone in engagement. The tension of these springs may be increased by tightening the adjusting nuts, care being taken to screw all three down an equal number of turns and not any more than is necessary to eliminate the slipping. Never attempt to cure a slipping clutch by throwing road dirt or sand into it as this abrasive material will score the surface of the cone in the flywheel and perhaps change the taper, which will make a new flywheel necessary.

If the cone "spins" making it difficult to engage the gears in the change speed gearing, and the clutch is found to release promptly, the trouble is undoubtedly due to depreciation of the clutch brake. This is a simple friction pad carried on an adjustable support and intended to bear against the clutch cone face when that member is pulled out of engagement with the flywheel. If the friction pad is not worn too much, the clutch brake may be adjusted by loosening the retaining nuts and moving it nearer the flywheel.

A Homemade Wheel Puller

IT'S A GRAND AND GLORIOUS FEELING

Salesman (at automobile show)—"Are you interested in a new motor car?"

Pedestrian Visitor—"Naw, I'm just seeing how it feels to dodge 'em without getting hit."

OLD speedometers have more than a junk value. It is rarely indeed that the recording parts are worn out at the time the instrument is scrapped, though a failure of the transmitting parts is usually taken for a like condition inside the instrument case.

But whatever the cause, do not throw away a discarded speedometer without first considering what may be gotten out of it. Inside are two counting or registering units that may be adapted to a variety of uses. The "trip register" unit has three "wheels" and so can be used for any number of three figures up to 999 or up to 99.9 if decimals are of an advantage. The total mileage unit has six wheels with a correspondingly greater range.

There are on the market a variety of speed counters, tallies, counters, and similar instruments used by hand and on machines where a repetition adds to a previous total and the footing is the number it is desired to know at all times. These instruments cost from five dollars to fifty. The units inside a speedometer are constructed on the same principle, of the same materials, and will either do the work as well just as they are or with a slight change in the part which turns the center shaft each time. Moreover, they are extremely compact. If a person has no use for the registering units himself, he can dispose of them at a good price in machine shops, printing houses, factories, and wholesale stores.

Some uses for these instruments might be named as—counters on printing presses or other automatic machinery, speed counters for taking the speed of revolving shafts, stock tallies attached to bins in place of the card system of perpetual inventory, yes, and even for baseball scoring. The fact that such counters may be turned backward or forward with equal facility makes them very attractive for shipping clerks who have to add incoming stock to that on hand and subtract the number of shipments at another time.

* * * * *

THREE fellows started a shop near us and went in strong for auto repairs. We heard indirectly that they did quite a little babbitting—main bearings and rod big ends—a class of work that we did only under protest, believing that the most satisfactory job is the cast insert or the block returned to the factory for re-babbitting. It is possible to do good babbitting of this sort but we were willing to let the other fellow do it, and our neighbors were soliciting a good bit of it.

One of the partners came in the other day to buy some babbitt metal. We had never sold him before and he explained that he wanted to get hold of something different from what jobbers had sent them. He had had trouble with their work standing up as it should; he told of their equipment and how they did the work, finally asking for any suggestions we could make. There were none, for their method was good, even if they had picked up their knowledge as garage assistants.

Well, this man had reached the door when he remembered another matter. Returning, he inquired if we had No. 000 emery cloth—said they had run out of it and

didn't like to use anything coarser for bearings. Ah-ha! This was the clue to the bearing troubles. Emery cloth used on babbitt will lose its grains under abrasion and these become imbedded in such soft metal as babbitt. Just as a diamond set in platinum, so will these grains be held, ready to cut anything with which they come in contact (the journals of the crankshaft) and under the friction of cutting they get moved in their own soft bed, so destroying what appears to be a smooth bearing surface. Emery cloth should never be used on a babbitted bearing,

Oil Expansion in Ford Car

From O. J. Miller, New York;—I am a Ford car owner of five years experience and know how to handle my machine. It is always given the best of care and never abused.

Recently, however, I have noticed that cylinders one and two are shooting oil, otherwise the machine is all right. But I have a number of peculiar problems I would like to have solved.

Every time I drive the car I find that it loses power after about an hour's driving, very noticeably on the hills, and then, after about 15 minutes more of this trouble it ceases and the car runs all right again. The oil level seems to be higher while the weakness exists.

If I am not very careful to keep the oil level exactly correct, half way between the two petcocks, then the car loses power. I am forced to run with one eye on that oil level all of the time.

I recently talked with another Ford "crank" who says that he uses extra heavy Socony oil in his car and is satisfied. Would you advise me to use heavy oil? The Ford instructions prescribe "medium."

Reply: It isn't a difficult matter to make an explanation for almost anything in the Ford car; just as easy as finding a place upon which to hang an accessory; but sometimes the explanations are just as unsatisfactory as the accessories. Anyway, the writer thinks he has the answer to your problems.

The change in the oil level may be caused by either or all of three things. First; expansion of the oil due to heat, this is normal and easily understood. Second, centrifugal action of fly-wheel forces oil into indicator and same escapes slowly, due to plugged opening. Third; oil drained from all parts into flywheel housing.

The "third" deserves more explaining. When car is first started the oil is distributed to timing gear housing and the three connecting rod troughs, leaving only small amount in base. But if engine is speeded up, just before it stops, the oil is splashed back into flywheel housing.

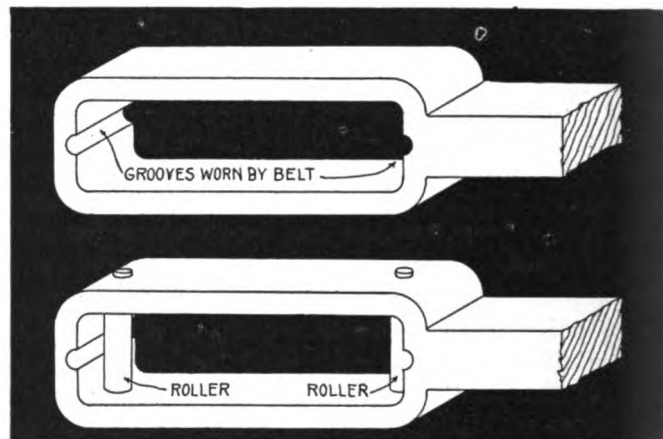
We see no harm in using a fairly heavy grade of oil, especially during the hot weather and would advise you to do so.

The peculiar power action is probably caused by the uneven expansion of pistons and rings. When first warmed the rings allow too much leakage, but as they further expand, they fill the grooves more completely.

BELT SHIFTER REPAIR

By Charles H. Willey

WHEN a belt shifter of the enclosed type such as is shown in Fig. 1 had become worn by the constant shifting of the belt, it was taken down and re-



paired by putting in vertical rollers, as shown in Fig. 2. The old shifter injured the belt by curling the edge; the new one corrected this.

COMPOSITION ON RAGS

Rags make paper. Paper makes money. Money makes banks. Banks make loans. Loans make poverty. Poverty makes rags. —*Pure Oil News*.

CANNIBAL—Our chief has hay fever.

CANNIBALLE—What gave it to him?

CANNIBAL—He ate a grass widow.

"Willie," said his mother, "I must insist that you stop shooting craps—those poor little things have just as much right to live as you have."

HELPFUL SMALL BOY—I beg your pardon, sir, but your car was stolen about ten minutes ago.

CAR OWNER—Well why didn't you raise an alarm and stop the thieves?

BOY—I never thought of that, sir; but it's all right—I took the number of the car. —*The Lightning Line*.

NO BARGAIN

"Dear John," the wife wrote from a fashionable resort, "I enclose the hotel bill."

"Dear Mary," he responded, "I enclose check to cover the bill, but please do not buy any more hotels at this figure—they are cheating you." —*Life*.

TWO DEFINITIONS

Optimist: Sick man learning to play a harp.

Pessimist: Sick man learning to shovel coal.

—*N. E. A. Service (Cleveland)*.

The Height of the Electrolyte

An important point in connection with all storage batteries is, the electrolyte in the cells should always stand well above the tops of the plates if any portions of the plates are exposed—are not washed, so to speak by the liquid, oxidization is apt to set up there, and trouble results later on.

The liquid should always stand at least half an inch above the tops of the plates. The cells should be inspected fairly frequently, and if the level of the liquid is below that figure, they should be filled up to proper level with *distilled* water.

This again is another important matter, *distilled* water should always be used if it can possibly be obtained, when mixing the electrolyte solution in the first place, and when filling up; if distilled water cannot be obtained boil the water thoroughly. The reason for this is, ordinary town water, and water obtained from springs, wells, rivers, etc., is not pure water.

Water has the important property of dissolving a very large number of what chemists call salts that may be present in the rocks, or river beds, etc., over which they flow; it is because of this property that we are able to make solutions of all kinds, the dilute solution of sulphuric acid for the lead battery for instance. If the water that is used to fill the battery contains any foreign salts, they will act chemically with the sulphuric acid in the electrolyte, and other salts will probably be formed, which will interfere with the working of the battery: they may be deposited in the pores of the active material, and set up additional electrical resistance, reducing the current that can flow during the charging period and the discharging period, and assisting to break up the active material and to cause it to flake in the manner described.

Perhaps an experience from primary battery work will be interesting, as illustrating this part of the subject. In a previous part of the article, the writer explained the working of the Le Clanche cell, how the zinc combines with the oxygen and the chlorine in the salammoniac solution to form zinc oxide and zinc chloride; these are both soluble in water, and therefore as long as there is plenty of liquid in the jar the battery will go on working very satisfactorily; but if the liquid is short, and occasionally when there is plenty of liquid, secondary chemical action takes place, two very obscure chemical salts are formed, two salts whose existence battery men only heard of after a skilful analytical chemist had investigated the matter. Zinc-ammonium-chloride, and oxy-ammonium chloride were formed; the first it will be noticed is a compound of zinc, ammonia and chlorine; the second is a compound of oxygen ammonia and chlorine.

The trouble in this case was, these salts crystallized out in the pores of the porous cells containing the carbon and oxide of manganese; the pores became gradually filled up, and as the liquid in the pores was the only path for the current, it was gradually reduced until the cell finally gave up furnishing any current at all.

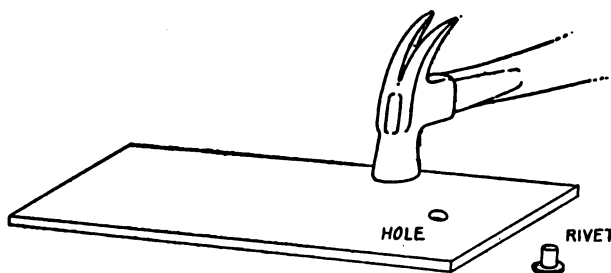
One cannot prophesy what salts might be formed with

the sulphuric acid in the electrolyte, in combination with some salt held in solution in the water; the great difficulty is this water, apparently quite colorless, and often tasteless, may hold some salt, or salts in solution, that are quite harmless until they meet some chemical, or some substance for which they have an affinity, and then combination takes place the nature of the electrolyte is changed, and other troubles arise.

A CONVENIENT RIVET SET

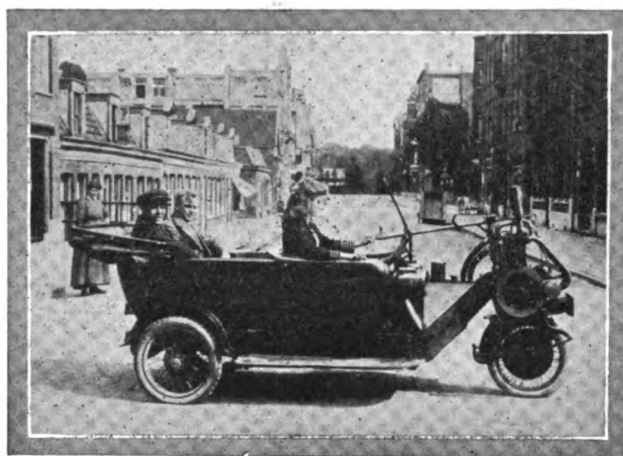
By F. H. Sweet

BEING in need of a small rivet set and not having one on hand, I conceived the idea of making one by taking a small piece of iron about one inch wide, three inches



long, and one-eighth inch thick, and drilling a hole the size of the rivet in the center, one-half inch from the end.

By hammering over the hole in the piece of iron and then around it a rivet can be drawn through nicely without spoiling the metal. All sizes of rivets can be made by using other holes.



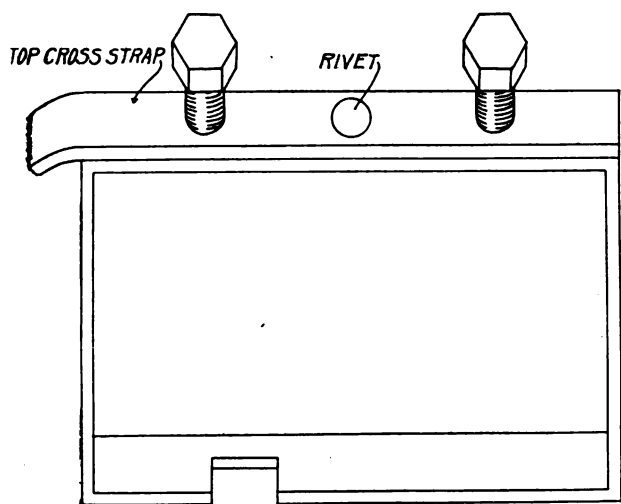
Keystone View Co., Copyright.
New Dutch Automobile with Three Wheels—Two in the Rear and one in Front.

Lack of knowledge causes fewer failures than lack of application of what knowledge one has.

COMPRESSING CLUTCH SPRINGS ON REO

By A. L. Prindle

HERE is a simple tool for compressing clutch springs for use when assembling the Reo clutch. It consists of a strip of flat iron, bent into a square, and riveted together by means of the cross strip as shown. The



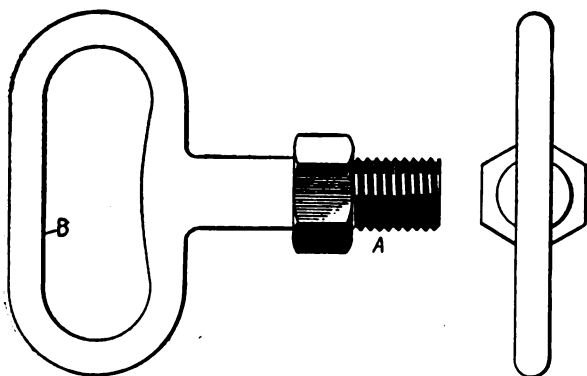
holes are drilled and tapped at each side of the cross piece for the pressure screws.

In addition to holding the ends of the top together, the cross strip also furnishes sufficient material to give the pressure screws a good purchase. The lower cross strip should be notched in the center as in the illustration.

CYLINDER HEAD HANDLE

By Henry DeDatle, Rhode Island

I AM sending the drawing of a handle which I have made to put on and take off the cylinder head of a Ford engine. The bottom end, A, is made of an old spark plug and the top, B, is made of three-eighths



inch iron stock shaped for the hand. It is then brazed in to the base of the old spark plug.

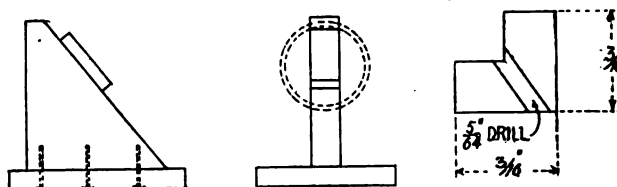
When in use it screws into the place for the number 3 plug and the head can be put on or taken off very much easier.

DRILLING HOLES IN PISTON RINGS

A DRILLING jig for a dozen pieces! "Unwarranted expense," is the cry. And so it would be if the jig were expensive and the job a rough one but not so if the jig can be made of wood in a few minutes and its use effectually guards against breaking of even one piston ring. There is shown in Fig. 6 the cross section of a piston ring that is popular in some regions and which is sent out undrilled so that the return oil holes may be put in or not according to the lubricating system employed on the car in which the rings are to be used.

A 5/64 inch hole is a pretty ticklish one to drill in a good solid piece that lies nice and flat on the drill press table—it is positively risky to drill in a ring weighing less than two ounces, a split ring at that, and with the hole running diagonally through the cross section. Any man that can put the holes in a dozen such rings without breaking one or spoiling drills is entitled to a place in the Hall of Fame—unless he has some special fixtures to aid him.

One piece of board is used for a base. To it is nailed an upright piece with one edge cut off to an angle of about 50 degrees. This angle corresponds to the angle at which the oil holes should run—or near enough to it for all practical purposes. On the slanting face is nailed a little piece of wood—either a complete circle or a piece, say



1/2 by 1 by 3—that will go inside the piston ring. The jig is then complete and ready to use as soon as clamped with C clamps to the machine table. It is safe enough for most men to use without clamping down but drilling is always safer when the work is well secured.

The ring itself is merely placed over the little block, resting on the slanting face of the upright piece. The hand is all that is needed to hold the ring while the drill is going through—the pressure and the location are taken care of by the fixture. The dotted line shows the position taken by the ring and this is the same for all the holes, it being necessary only to revolve the ring to four or six places according to the number of oil holes the makers prescribe. What time is spent in making the jig will be made up in drilling, besides which there is the assurance of having a full set of rings when done and doing this with few or no drill breakages.

A business letter is a photograph of the firm that sends it when the firm is otherwise a stranger to the recipient. If it lacks neatness, directness and the other elements of a good letter, it should, of course, not be sent.

—Associated Advertising.

WHERE MOTOR CARS WERE PROHIBITED

MOTOR vehicles were strictly prohibited on the Island Prince Edward from 1908 to 1913 after which automobiles were permitted to be driven on the streets of Charlottetown and one other small town on three designated days per week. Practically all these restrictions were removed in 1919 except that motor vehicles are not allowed to operate outside of towns and cities during the month of April when the roads are very soft from spring thaws.

Progress has been remarkable since these restrictions have been removed, says Consul Crosby, in a report to the Department of Commerce, and today there are 1753 passenger cars registered in the Province, which has a population of 88,000 people. There are only 70 trucks registered in the province and most of those are of $\frac{3}{4}$ ton capacity or smaller, due to the poor country roads. It has been intimated that efforts will be made to limit the capacity of trucks in the Province, but no definite decision has as yet been reached.

It is estimated that there are 58 wheel type and 26 caterpillar type tractors in use, but on account of the small size of the farms in the Province the owners of the tractors are of the opinion that they are not an economical success. Three motor propelled fire-fighting engines are in use in Charlottetown, it being the only city in the Province which uses self-propelled apparatus.

FOR A STUDEBAKER

STUDEBAKER cars have a row of bonnets on top of the engine with 1-5/16" hexagon sockets in them—"countersunk plugs" they are called in the pipe fitting world. A gasket underneath the flange is supposed to keep the combustion chamber tight but a great many Studebaker owners have trouble with leaks around the flange.

The pressed steel, hollow, hex wrenches supplied or purchased in sets are not strong enough to screw these bonnets up gas tight or the location is such that sufficient leverage cannot be obtained. As a result, many of these popular cars are running with a loss of compression and there is a breath of oil working out around the cylinder head all the time, giving the engine a decidedly mussy appearance.

The remedy for this trouble is the right kind of a wrench. This can best be made as follows—it will appeal to the individual owner but more so to the garage man who does service work on this make of car.

Secure a piece of hexagon steel 14 inches long, measuring 1-5/16" from flat to flat. Turn this down to $\frac{3}{8}$ inch in diameter, leaving only 1 inch of the hex and making a quarter inch radius in the corner. The turned part is to become the handle. Heat the piece red hot in the section just back of the hex head and, placing the hex in a vise, bend the handle almost at right angles.

You then have a wrench which will fit the recess in the bonnets, will not crush under the strongest pressure, and a one-piece job with a good long handle. No more leaky gaskets then.

ORDINARY steel grease cups are formed from a disc of flat sheet steel and one of the operations upon the piece in the process is punching a hole through the end to allow the grease to be squeezed through.

If the user of these cups will have that hole in the end enlarged to the full size permitted by the inside of the threaded end, he will find that grease will flow more positively and that there will be less of it working out around the edge of the cap and on the fingers, this latter being the curse of the plain grease cup.

EXCEPT in the case of a revolving shaft, no first class job—a permanent job—ever was made with the shaft loose in the hole. Whether it's a gear or flywheel, pulley or lever, keys and set screws will not keep it tight if it is transmitting any power at all, if the shaft is loose—at least a light force fit is necessary to insure good permanent service. And the same is true of a bolt or stud—a tight original fit is better than all the locks in the world (but it costs more to produce).

UNTIL all mechanics must pass an examination or must serve a three years' apprenticeship under proper supervision, car owners might better do their own overhauling as far as possible. Scan over the list of garages in your vicinity, see if there is a trained mechanic in any one of them—a man who knows materials and machinery, who studies and thinks.

If there is, take your car there. If there is not, take the car apart yourself; anything that looks wrong which you cannot replace or repair, take to a good machine shop not connected with "sales and service"—you will get intelligent advice even if they don't cater to the auto trade. But before taking the car down, be sure there is reason for so doing—too many people tinker with their cars—they're better left alone or, as one man put it, "he used Christian Science on everything short of a broken spring."

CRUEL!

"I once knew a man that stayed home with his wife every night for thirty years."

"Ah! that was true love!"

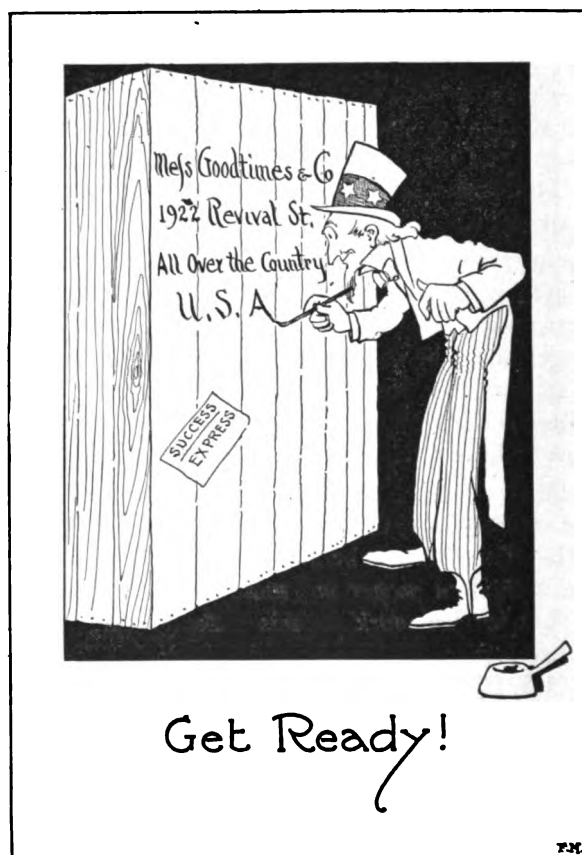
"No, that was paralysis."—*New Departure News*

RETAIL TRADE STIMULATORS

What do you do to stimulate trade in your neighborhood Mr. Dealer—and this includes the Garage man who has a little accessory store that he runs as a side line—but who ought to try and build it up into a regular store. What do you do to catch people up to the show window? Do you use window stickers or counter cards? Do you circularize your neighborhood using an attractive cut or two in your circular to catch the eye and help hold the attention, or do you just sit around waiting for something to turn up?

Too much sitting around doesn't even keep your business stationary but it assuredly does help to make it go backward and that's bad. Why not make that Garage Accessory Shop Pay? Why throw the goods in the window with the remark that "O, people know I sell this stuff; what's the use of me putting up any window stickers or circularizing or having any show cards made—the people know me and when they want anything in the accessory line then they come and see me. If that's a fact it's mighty strange folks haven't patronized you to the extent that you've been compelled to enlarge the accessory part of your business. It's never too late to mend—start in now and cut out the pictures you see on this page and stick them on the window glass. Watch them come up and look. Cut them out and have your engraver reproduce them in printing plate form so you can illustrate your circulars.

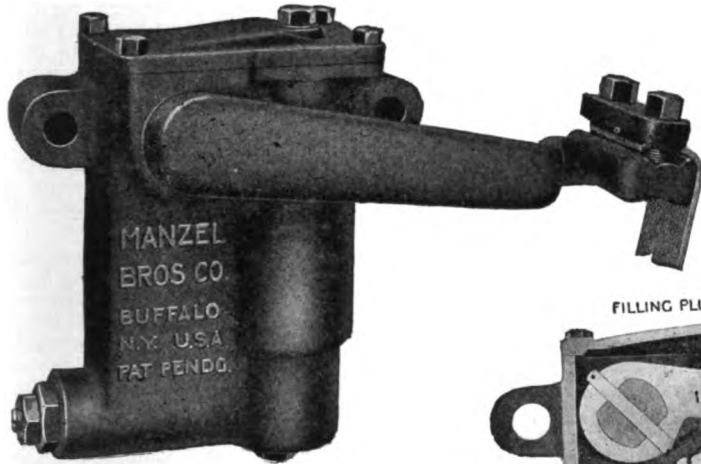
Christmas is coming and you want to get your share of the gift trade—don't put it off—get a move on and you'll get more business.



New and Useful Automobile Accessories

A New "Manzel" Product

A shock absorber embodying several new features is announced by Manzel Brothers



Company, 321-323 Babcock St., Buffalo, N. Y.

This new device is of the hydraulic type and can be furnished for practically all models of cars. It is attached to the frame, and is connected to the axle by means of a strong webbed strap and clamp. It does not interfere with the normal compression of the springs, but cooperates with them to check the rebound, preventing spring breakage and side sway, and causing the car to ride smoothly on all roads.

An exclusive feature of the "Manzel" is its automatic control by means of double acting valves, which open and close according to the severity of the shock and control the passage of the oil (which is used as the cooperating medium) between the inner and the outer chambers. When the automobile spring compresses, the piston moves upward and the oil is drawn into the inner chamber (3) directly below the piston. When the spring attempts to expand, or in other words to rebound, the arm is pulled down by the webbed strap and acts through the cam (1) on the piston (2) which in turn exerts a pressure on the oil in the inner chamber (3). The oil is forced slowly through the valve opening at (6) allowing the spring to expand so gradually and easily that the shock is scarcely felt by the occupants of the car.

In the case of an extra severe bump, the initial shock opens the relief valve (5) increasing the opening around valve (6) long enough to allow sufficient oil to pass through to relieve the strain, when it again closes to its original position and the oil is forced through the opening exactly the same as occurs when less severe shocks are encountered.

The mechanism is quick acting, responding instantaneously to every shock.

The valve action may be regulated for any weight of car by increasing or decreasing the size of the valve opening at (6) with the adjusting screw.

All working parts are immersed in oil, making the mechanism self lubricating, free from wear, and noiseless in action.

The installation is simple and any mechanic can install a set in four to five hours time. The list price is \$90.00 for a set of four.

"The Backbone of Automotive Service"

We are indebted to the Jacobs Manufacturing Co. of Hartford, Connecticut, the well-known manufacturers of drill chucks, for a copy of their excellent booklet entitled "The Backbone of Automotive Service." This booklet is intended to promote a more general appreciation of the importance of adequate shop-equipment in the service station. We understand that this book will be sent free to any reader of this magazine who will write for it, mentioning this magazine.

The Red Star Timer

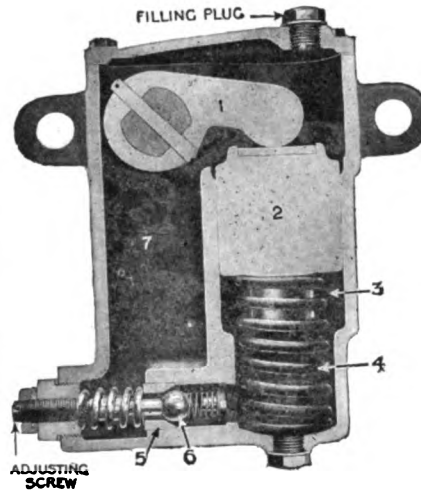
No matter where Red Star Timers are sold—in a cross road's garage, or in the finest accessory store, it's almost impossible to miss seeing them. The flaming red and blue display carton for window, counter, or shelf impells attraction.

Another reason Red Star Timers are so well known to Ford owners and dealers is that they were the first timers to be nationally advertised. Their wide spread popularity has continued to increase, year after year, because they keep the Ford motor hitting on all four for thousands of miles.

According to the makers, Advance Automobile Accessories Corp., 1721 Prairie Ave., Chicago, Red Stars are the finest timers produced, and made in the world's most accurate timer factory. Because it is recognized that the timer is the hardest working part of the Ford engine, special attention has been given to the development of roller and race—the two timer parts subjected to greatest wear and tear.

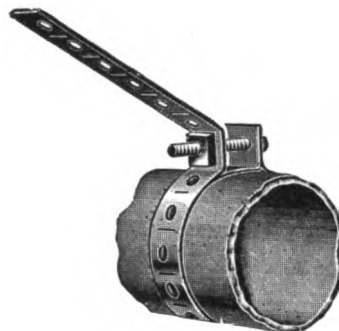
The roller is 100 point carbon tool steel, as accurately tempered as a fine tool. High carbon tool steel is used because it is the only material that insures absolute uniformity in hardness and wear. The roller is ground concentric to within .001 of an inch and polished to remove the slightest irregularity. This guarantees a smooth, even running roller that will not jump or chatter against the race.

The race is finest selected fibre, every bit tested for hardness and toughness. During manufacture Red Stars are tested nine times. Insures their standing up in service. A final electrical test guarantees they will never short.



Universal Hose Clamp

A Hose Clamp which is said to fit any size hose is manufactured by the Universal Hose Corp., Hackensack, N. J., and is called the Universal Hose Clamp. This clamp consists of a band of tough cold rolled ribbon steel, a bolt and nut.



In this band there are holes every five-eighths of an inch, with scores between the holes. It is only necessary to clamp the band around the hose and insert the bolt in the nearest hole, then tighten up the nut and break off the overlap at the score. The whole operation requires but a minute or two and is easily accomplished.

The dealer needs only to stock two sizes to take care of all demands from one inch in diameter up to six feet if necessary.



The Wallace Electric Glue Pot

In most shops where glue is used there is much trouble from uneven heating.

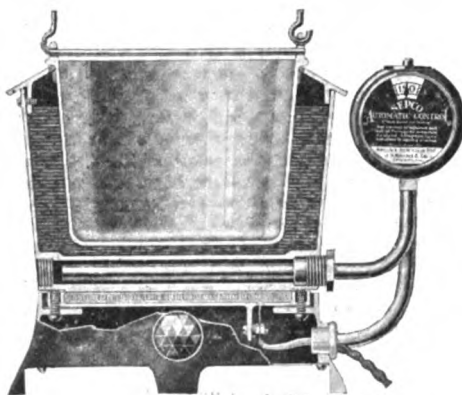
Today, the Wallace Glue Pot, here illustrated, equipped with a reliable, fully automatic heat control device, is filling the need in an efficient and reliable manner.

There are several exceedingly practical and interesting features incorporated in this new bench glue pot the foremost of which is of course the automatic heat control which keeps the temperature of the glue between 140° and 150° at all times.



There is a tube immediately above the heating element containing a sensitive volatile substance which contracts and expands with the slightest change in temperature and provides a dependable action of ample power to actuate the control switch. When the heat reaches the proper temperature the control turns off the current. When the temperature falls a few degrees the heat is turned on again. Since this action is automatic workmen need not watch the temperature and an increase in production is the direct result. The temperature gauge dial always shows the heat attained and together with the jewel, set in the base casting, acts as a visible check on the heat maintained.

The glue pot operates from any electric lighting circuit and is put in operation by merely turning the switch. The Wallace Bench Glue Pot functions either as a water bath, hot air or dry heat pot and which ever way it is used it can never overheat though the current be left on over night.



There is a durable cast aluminum glue container supported by special retainer lugs which prevent floating when the pot is but partly filled. The escape of moisture is greatly minimized by this method of suspension. The base cover forms a dead air heat insulator chamber between the heating unit and the bench, and the air gap which surrounds the heating unit is further insulation between the heat unit and the base casting. The insulation and control of the current for fire protection have been approved by the Underwriters Laboratories. Part of the bail extends across the center of the pot as a brush wiper eliminating overflow and dripping.

This glue pot is adapted for heating any

substance which requires a definite working temperature, such as heating or melting glue, wax, pitch, tar, sealing compound or resin and the following are the principal advantages claimed:

Wholly automatic in action and therefore requires no attention from workmen.

Glue is kept always and invariably at correct temperature for maximum strength and viscosity.

Eliminates losses through spoilage of work due to overcooked or underheated glue.

Can be used either as water bath or hot air or dry heat pot.

Can be used as glue cooker or as warming pot in connection with central glue cooker.

Heats quickly, thus saving time in getting work under way.

Cannot cause fire from being left on over night.

Maintains heat with minimum expenditure of electricity.

Does not boil, waste nor injure glue from over or under-cooking.

J. D. Wallace & Co. of Chicago make these glue pots in two, four and eight quart sizes and weights range from 20 to 40 lbs.

If you will address the manufacturers mentioning this article they will be pleased to send you further information and descriptive literature.



Butler Develops New Style Piston

The new type of Bu-Nite Steel Band Piston recently developed does that thing that the engineers have said they would like to have a piston to do, but is impossible on account of the expansion of a light weight alloy metal.

The demand, that a light weight piston, made of a metal light in weight, possessing bearing efficiency and strength, rigid in construction, that may be fitted to cylinders allowing no more clearance than is required by an iron piston, is being supplied.

The Bu-Nite Steel Band Piston can be installed, allowing less clearance than the iron piston required with perfect safety.

The most valuable feature is, the piston has a less degree of expansion than the cylinders, consequently the cylinders of a hot engine are expanded to a greater diameter. The piston expanding at a less degree allows more space between cylinder and piston for lubrication which is the desired condition in a heated engine.

This especially designed Bu-Nite Steel Band Piston is thermostatically controlled.

The piston is of a rigid construction, capable of maintaining its shape with reference to distortion, as it does not have irregular wall thickness, is made of a material reducing the weight to less than one-half that of a substantial iron piston, the metal is very tough, with a bearing efficiency equal to that of bronze, the metal has high conductive properties which is a decided advantage in dissipating the combustion heat.

The bearing efficiency is of great importance in maintaining ring seats and piston pin bearings, also prolongs the life of the piston.

The New Bu-Nite type is very rigid in construction, due to the fact that two solid steel bands, particularly designed to properly function and of a smaller diameter than the piston, are cast within the skirt, which is the feature controlling the expansion.

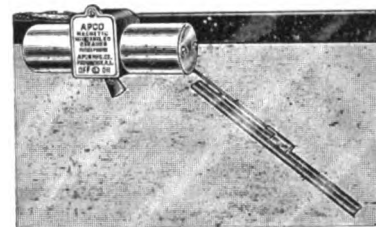
The steel bands, one above the boss, the other at lower end of skirt, forming a track controlling the expansion, producing a most rigid and substantial piston.

The results from actual road tests are ideal, having the advantages of a light weight piston built from a non-scoring material, of wonderful bearing efficiency, which does not wear the cylinders as rapidly as an iron piston, prolonging the life of connecting rod and crank shaft bearings, very rigid in construction and increasing the efficiency of an engine.

Butler Manufacturing Company, 3234 West Washington St., Indianapolis, Ind., has spent a great amount of time making tests and subjecting the new piston to all imaginable tasks under adverse conditions before placing same upon the market and they say that the best part of it all is that it will do what they claim it will do in a demonstration and then keep on doing it!

An Automatic Windshield Cleaner

The Apco Mfg. Co. of Providence, R. I., have just announced an Automatic Windshield Cleaner that works on an entirely new principle in that it uses magnets in-



stead of the motor which is used by other manufacturers of electric cleaners.

Among its many features might be mentioned its uniform high speed which does not vary with the speed of the car—it operates about as noiselessly as a clock—it uses very little current, about 3 amperes—it can be installed on any car by simply drilling three holes in the windshield frame—it is small in size and its appearance adds to the finest car—it is simple in construction and its very few moving parts insure its dependability—the cleaner arm is always up out of the line of vision when not operating and the whole device is 100% efficient.

The Apco guarantee is back of each cleaner. Write for prices and particulars.

The Balling Motor Cleaner

It is a problem for the auto owner or repair man to keep the engine conveniently clean, without soiling hands or clothing. The Balling Motor Cleaner, here illustrated, serves this purpose admirably. With the aid of this cleaner, every nook and corner of your engine can be QUICKLY and CONVENIENTLY cleaned. No ex-

STRAIGHT UPLIFT AND ROUGHENED BEARING SURFACES of its four jaws PREVENT ANY TENDENCY TO SIDE OR TORTION STRAINS, also ALL SLIPPING OR WOBBLING. ITS UNIVERSAL SCOPE INCLUDES V-SHAPED ENGINES, WHERE OTHER VALVE LIFTERS FAIL.

Repair men all praise this tool highly.



perience is required to be able to use it, it is so simply constructed a child can operate it. You get it ready for use, no attaching, no installing. Ford owners are especially asked to note the easy way in which they can clean the inside and the outside of the commutator, thus practically eliminating all their starting troubles.

This cleaner is manufactured by the Balling Manufacturing Co., 306 Penn Street, Brooklyn, N. Y., to whom all inquiries should be addressed. In writing them mention this magazine.

The Dorrance Valve Lifter

The Dorrance Valve Lifter is made by Chas. J. Dorrance, Chicago, Illinois. The following points of superiority are claimed: It is simple, strong and durable. It has a simple and effective locking device, which



holds the jaws firmly apart at any point of lift. It is free from objectionable ratchets, springs or screws. Hand pressure gives ample leverage.

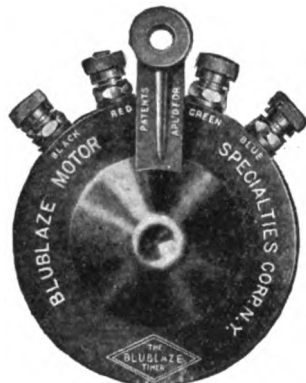
Leverage is ample to lift any valve spring, but it is not strong enough to ever bend valve stem. This is VERY IMPORTANT because too much leverage often does this with other types of valve lifters.

FIVE FULCRUM BEARING POINTS permit the lower or upper jaws to be moved forward or backward one or more notches, which with the ability to reverse the four jaws provides several useful combinations as required.

The Blublaze Timer

The cut gives an idea of the appearance of the Blublaze Timer. It is molded of condensite, which is one of the world's best known insulators. The terminals are all at the top, which enables the motorist to check up the connections at a glance without removing the timer.

These overhead terminals also keep the wires from becoming grease and oil soaked. In addition, they are numbered to corre-



spond to the cylinder to which connection belongs, and are labeled "green," "red," etc., to agree with the color of the timer wires.

Contact is made through a special composition brush made of copper, carbon and graphite which is wiped with even pressure over the highly polished raceway in the timer shell. The composition of the brush is designed to eliminate pitting and also to do away with the necessity of lubricating the timer. The brush gives thousands of miles of service, and is quickly replaceable at trifling cost.

Write Blublaze Motor Specialties Corp., 43 Seventh Ave., Long Island City, N. Y.

The Wedford Savex

The Wedler-Shuford Co. whose address is 3540 Olive St., St. Louis, Mo., are offering an entirely new device which they state is the only one of its kind on the market. No doubt our readers are aware that the automotive engineers are giving quite some study now to proper carburetion and automatic regulation of carburetors. The public feel that they are entitled to have low speed, close throttling characteristics and the car still be capable of climbing on high gear all ordinary hills. A scientific system of carburetion is the answer.

The Wedford Savex here illustrated has been perfected after three years of careful experimentation. For fourteen months the device has been in actual service on Ford engines and has met every requirement under all circumstances and conditions 100% satisfactory.

It is claimed that this invention will save 25 to 30 per cent daily on gas and give maximum power, speed and economy. It gives quick smooth acceleration—no choked or loaded carburetor. It economizes on the gas consumption by feeding the cor-



rect mixture for the varying temperature of motor and load conditions, and minimizes carbon deposits. For full particulars write direct to the manufacturers and mention this publication.

The Stirling Lock

For years the motoring public has been subjected to a variety of petty thieving, chief of which has been the loss of motor-meters. Although many devices have come upon the market, designed to safeguard motor-meters against such pilfering, none, unfortunately, has been thief-proof. The illustration shows an effective thief-proof lock, which renders it impossible to remove the motor-meter. The lock has been given the trade-mark name of Stirling Lok. It not only answers its intended purpose but is well designed, graceful and makes an



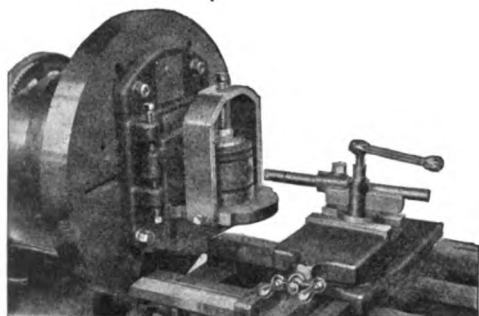
ornament for any car. It is manufactured by the East Chicago Manufacturing Co., 4426 Olcott Ave., East Chicago, Ill.

Extension Gap Lathe and Attachments

For many years we have carried in our advertising columns interesting announcements of their line of lathes from the Barnes Drill Co. of Rockland Ill., who makes a specialty of manufacturing extension gap lathes for garage and auto repair shops. This enterprising company has

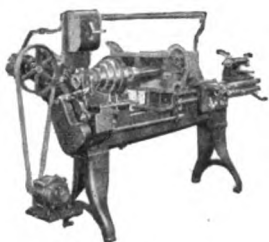


recently added several new and handy attachments, two of which are illustrated herewith. The piston vise attachment holes and centers, for reboring pin holes, all sizes of pistons up to 5 inches diameter.



This attachment not only fits the Barnes lathes, but can be used in full plate of any lathe.

The piston cone center and driver is universal for all styles and sizes of pistons up to 5 inches diameter. It has a



No. 5 Morse taper shank. Other tapers furnished at extra charge.

The attachments described above will appeal to any auto mechanic. Write for prices direct to the manufacturers and mention this magazine.

An Innovation in Lubrication

It has been the usual practice to pack transmission and rear axle with grease, in the belief that the more grease used, the easier the running, the less liability of wear on parts, and, of course, less frequent greasing. It will surprise most car and truck owners to learn that cars and trucks will run further (without power) from a down hill start without lubrication of their running parts, than they will with gears and bearings packed with the ordinary greases. This has been proved by actual tests. In order words, packing with ordinary greases retards movement, rather than increases it. It was to overcome the effects of ordinary greases that Mr. S. W. Whitmore, of the

Whitmore Manufacturing Co., Lubricating Engineers, Cleveland, Ohio, U. S. A., experimented many years ago until he perfected a type of lubricant that would retain its consistency in any temperature, from 10 degrees below zero to 300 degrees above Fahrenheit. He developed its adhesive quality to such an extent that it could be flattened out under enormous pressure, to the thinnest film without breaking. It is claimed for Whitmore's Lubricants—and the claims are substantiated by tests at the Panama Emergency Dams; by the Hudson Motor Car Co., under racing conditions; and by engineers of big industries—that Whitmore's will prolong the life of gears 500%. It is claimed, also, that if housings are tight, so there is no leakage, one filling of Whitmore's will last for more than a year. Then the lubricant may be drained off, strained and used over and over again. The point of this article is that ordinary greases clog the mechanism of running parts without actually protecting them from quick wear. Frequent fillings are necessary. During the filling operation, trucks are unproductive, and labor costs are run up. Incidentally, though extremely important, replacement of worn parts is expensive, and reduces profits. Whitmore's is not new, but has just been placed on the market. For 29 years the entire output has been absorbed by automobile manufacturers, railroads, electric lines, manufacturers of printing presses, and other big industries. Though it costs more per pound than ordinary lubricants, Whitmore's is really an economy "buy," because it never wears out; cars and trucks run easier, because the lubricant is properly distributed over every part of the mental without "packing"; running parts wear longer, because there is no wear except on the lubricant itself; labor costs are reduced, because only ONE filling is necessary during a year's time; and even if there is leakage, Whitmore's will lubricate perfectly with only a thin film of it left on the gears. For the operator of a fleet of trucks, or the individual truck owner, Whitmore's comes as an innovation in lubricants; one that should prove a big money saver and an improver of truck service.

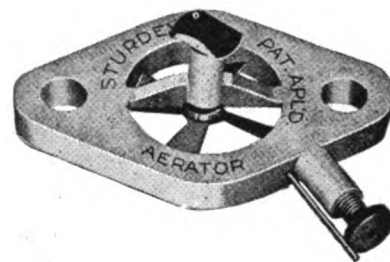
The Sturdevant Aerator

The constantly increasing price of gas has worked a hardship on the motorist. The new Sturdevant Aerator has just been placed on the market and it is claimed will increase mileage 50% and eliminate 75% of spark plug and carbon troubles. The aerator is made special for Ford and other makes of cars in sizes according to carburetor measurements. The Sturdevant Aerator is installed between the carburetor and the inlet manifold flanges and a propeller device which revolves rapidly with the intake of the motor mixes the air scientifically with the gas breaking it into a fine mist before entering the carburetor with the result that more power and mileage on less gas is obtained. Each cylinder also draws in a uniform gas mixture and the latter is always thoroughly aerated, insuring a smooth running motor and minimum of carbon accumulation.

The Aerator is guaranteed by the manufacturers to satisfy all customers or money refunded. It sells in all sizes for \$3.50 retail.

The manufacturers, the Federal Engineering Company, 45 Eighth St., Detroit, Michigan, will be pleased to mail out litera-

ture to all car owners and dealers concerning their product.

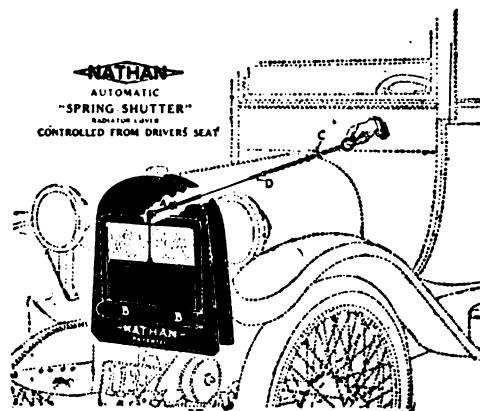


Nathan Radiator Covers

Automobile accessory dealers throughout the country have acquired a favorable opinion of the large line of automobile specialties manufactured by the Nathan Novelty Mfg. Company, 55 Fifth Ave., New York City.

This new "Spring Shutter" Radiator Cover which has just been placed on the market by this enterprising manufacturer, is adjustable from the dashboard. A touch of the chain and the dash adjusts the Nathan Spring Shutter exactly as you want it, and you can readjust it just as often as you need to without moving from the driver's seat.

The great convenience of such a device for Winter driving is too obvious to need any detailed explanation. It is generally agreed that no car should be operated in cold weather without some protection for the radiator, and this new radiator cover combines every point of excellence that in-



ventive genius has been able to discover in an article of this kind.

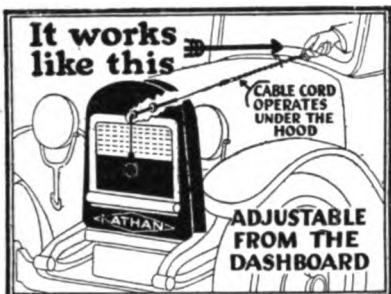
The Nathan Radiator Cover is guaranteed as to material and workmanship and if any part should show a defect, same will be replaced free of charge if the faulty part is sent to the Company with full particulars as to the defect. This radiator cover is reasonable in price and should be stocked by every live dealer in automobile accessories.

Write for prices and particulars direct to NATHAN NOVELTY MANUFACTURING CO., 55 Fifth Ave., New York City.

In writing to any concern having a reading notice under the head of New and Useful Automobile Accessories please mention this magazine.

NATHAN

SPRING SHUTTER RADIATOR COVER OPERATES from the DASH



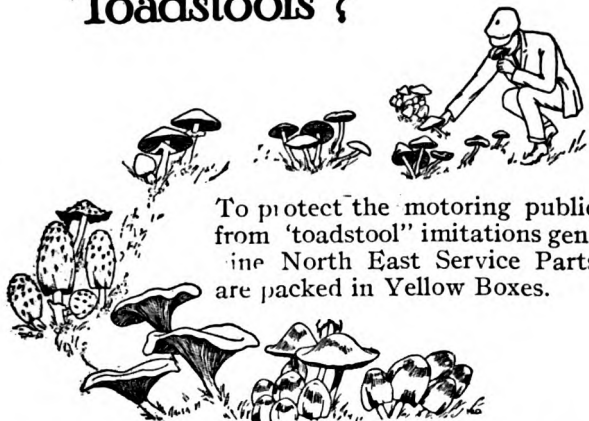
FOR ALL CARS, NO. A. D. 366 LIST PRICE \$6.00

"HOT DOG" Brand Radiator Cover: For Fords
No. A D 400 A Radiator Cover, List Price \$1.50
No. A D 400 B Hood Cover, List Price 2.00

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NATHAN NOVELTY MFG. CO., 55-Fifth Ave., New York
Central West Distributors
STANDARD MOTOR PARTS CO.
Chicago, Ill.

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Mushrooms or Toadstools?



To protect the motoring public from "toadstool" imitations genuine North East Service Parts are packed in Yellow Boxes.

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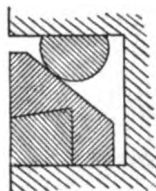
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*"particularly effective in
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PRESSURE PROOF PISTON RINGS



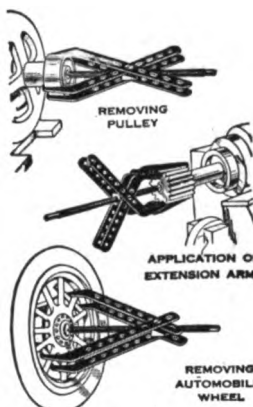
"Rings . . . that, due to their design, stay tight in the grooves throughout their life. A typical ring of this kind is shown . . . This ring we have found particularly effective in overcoming oil-pumping under a wide range of conditions."

*Extract from a paper read by a prominent
Automotive Engineer at a meeting of the
Society of Automotive Engineers.*



PRESSURE PROOF PISTON RING CO.
107 Massachusetts Ave. Boston, Mass.

REPLACES OTHER TOOLS



The "Little Giant" and the "Big Buster" cover a range of work which is not approached by any other combination of pulling tools on the market. These tools can not spread, turn or slip off the work—no arm locks required. **"THE HARDER THE PULL—THE TIGHTER THE GRIP."** A principle quickly understood and appreciated by mechanics who have had experience with ordinary pullers.

Makes Your Hard Pulling Jobs Easy

"Little Giant" is quickly adjustable up to 13 inches for outside or inside pulls. It is especially adapted for pulling timing gears or where space is limited by close-

ly fitting gear cases, etc.

"Big Buster" has an open adjustment to 40 inches. For pulling motor truck and tractor wheels, heavy fly and gear wheels, pinions, transmissions, drive wheels, etc. it has no equal. **A DIRECT PULLING POWER OF 50 TONS EASILY OBTAINABLE.**

Every garage, service station and auto-repair shop have an actual need for both the "Little Giant" for all ordinary jobs, and "Big Buster" to handle the heavy work. They will be a desirable and profitable addition to your tool stock.

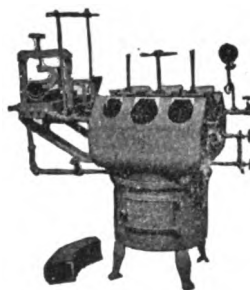
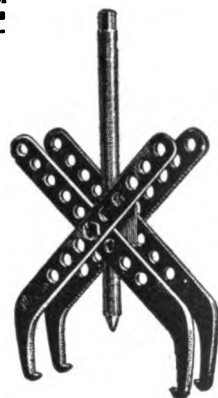
Little Giant, complete with Extension Arms, Price \$12.00

Big Buster, complete with Wrench and Handle, Price \$50.00

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The Best and Most Economical Tire Re- pair Equipment —for any tire repair shop

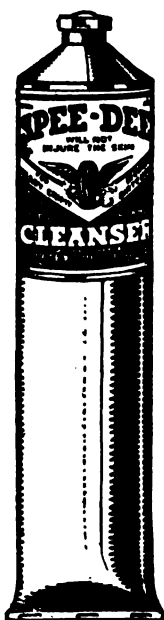
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Handy Size for Motorist and Mechanic—Fits the Side Pocket of Car.

Retails for 15c.

Introductory Offer is Exceptionally Profitable.

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670 W. Austin Ave., Chicago.

COMMENTS FROM JOE BELL



MONKEY sees, monkey does" runs a one-time popular expression. The truth of this may be seen in the vast number of poor drivers on the road. They are their own worst enemies while acting as the best feeders that repair and accessory shops have.

Consider the rear end only. Consider only two points in driving, i. e., fast driving around corners and the "fast stop." This making corners at a high rate strains the axles and housings, puts an excessive load on the thrust bearings, twists the springs, and tears tires. In rounding a corner at high speed, the centrifugal force of the vehicle is tremendous; all this load is thrown toward the outside of the curve and is carried down through hangers and springs to the axle housing—then because rubber tires possess a high factor of adhesion to the road, this force crowds every part of the axle assembly.

A few months of this and the rear end is noisy and wobbly, ready for new parts or the junk heap. Then, if it happens that the centrifugal force is greater than the adhesion to the road, the tires skid while their tread is roughened or torn.

The driver who makes the fast stop runs up to within a hundred feet of his destination at 20 m.p.h. before closing the throttle or releasing the clutch.

At a hundred feet he begins to do these things, followed by an application of both brakes and a grand stand finish ending as desired but with two wheels sliding. The slower the speed, the more the brake bands take hold so that the wheels slide in the end even if they do not when the brakes are first applied. And sliding wheels mean ruined tires and stresses on brake supports greater than they were designed for.

There are in every community a few dashing souls, speed maniacs, or whatever name may be applied to them and these persons build up a reputation for driving. Younger or less original drivers, especially those who have recently acquired a car, seek to draw attention to their prowess by initiating the driving stunts of the dashing ones as herein related. Monkey sees, monkey does—and the garage men profit greatly thereby.

ALL cars suffer from air leaks around valve stems after running up considerable mileage—Buicks are no exception to this, in fact, they may suffer a little more than others because the spring and washer is on top where it shuts off the view of sliding parts and the owner may be pardoned for not thinking of lubrication there until too late.

Buick valves work in removable cages so that one does not have to go to the expense of boring out and bushing but may put in either new valves or cages according to where the looseness really is. However, most service stations will not sell the valves or cages separately and, as the assembly costs about four dollars, the owner decides that he will put up with the air leak for a while longer rather than re-fit all six cylinders.

A very good substitute for this on some of the Buicks may be found by recourse to the ever-ready Ford parts list. Those engines having 5/16 inch valve stems may be fitted up with Ford valves having oversize stems. When the hole in the cage is badly worn, it should be reamed out to 21/64 inches and it will then be ready for sixty-fourth oversize stems.

Less wear may be taken up by using smaller stems and just rounding up the worn hole. These Ford valves may be bought for fifteen cents, which shows a big saving to the owner of the car. The stem will have to be shortened to suit the travel of the Buick rocker arm and the hole in the stem elongated to take the valve spring cotter, though it is possible to use a straight round pin instead of the cotter.

CHANGING THE BASIS

"Mr. Smith," a man asked his tailor, "how is it you have not called on me for my account?"

"Oh, I never ask a gentleman for money."

"Indeed! How, then, do you get on if he doesn't pay?"

"Why," replied the tailor, hesitating, "after a certain time I conclude he is not a gentleman and then I ask him."

—Harper's Magazine.

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FAWSCO AUTO FUSES



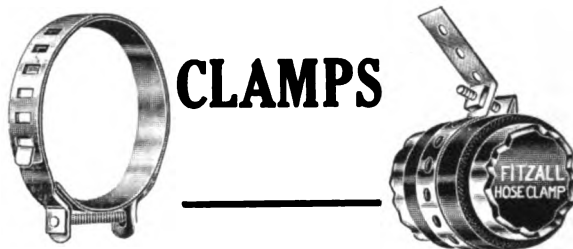
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Made in strict accordance with S. A. E. specifications and carefully inspected. FawSCO Fuses are capable guardians of the Electrical Circuits of your car. Get the best and look for the name on the envelope of 10—just enough for emergencies.

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Automobile Dealer and Repairer

THE MECHANICAL MOTOR MAGAZINE

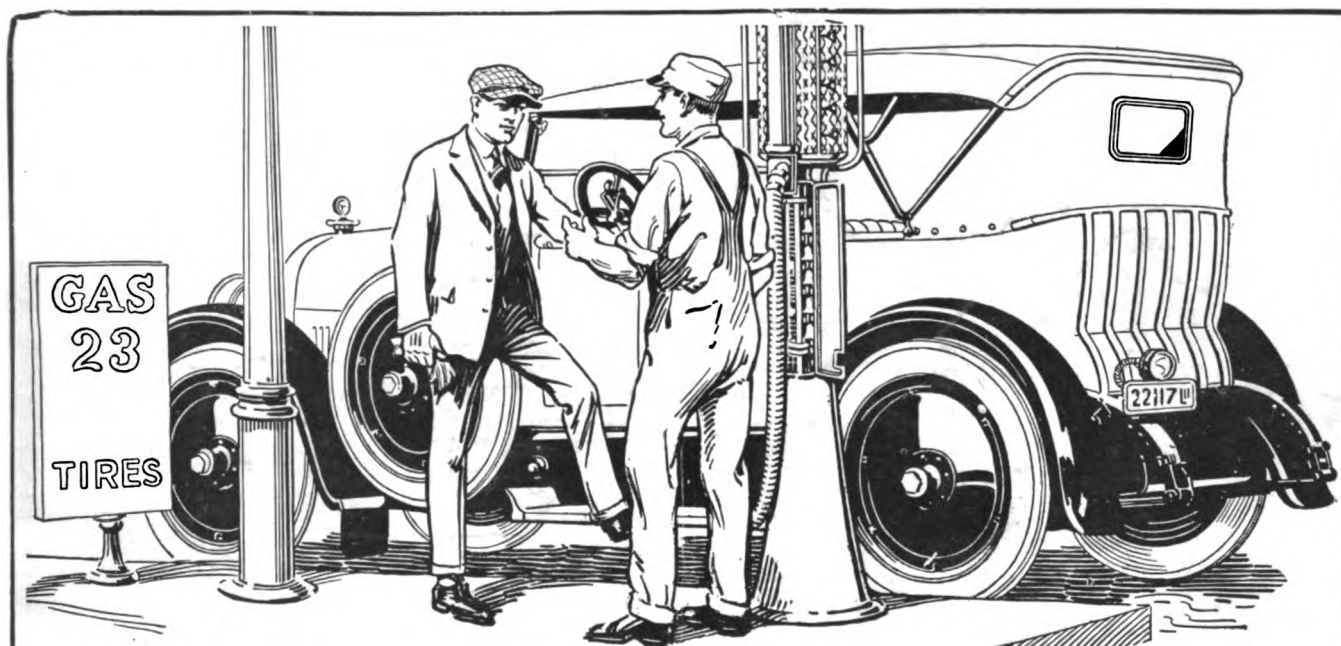
THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 16-22 Hudson Street - New York City

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Vol. 34, No. 3.

NOVEMBER, 1922

Monthly \$1.50 per Year
Single Copy 15 cents



“Got Plenty of Patches for Your 5 Minute Vulcanizer?”

IT'S AN EASY QUESTION to ask while you are selling gas or changing a tire or loaning a pair of pliers. It's the easiest way to “ask 'em to buy.” If the driver has a **Shaler 5-Minute Vulcanizer** he is likely to be almost out of patches to use with it and he will welcome the suggestion. If he is one of the few who doesn't have a vulcanizer, he'll say so and give you the easiest kind of an opportunity to make a sale.

Without doubt this is one of the most popular accessories on the market today. Of course **you** know that anyone can use it to make permanent tube repairs on the road in five minutes. You know how pleased you were the first time you used one and saw it **vulcanize** as quickly as you could stick on a temporary patch. Pass your experience along to your customers, especially the tourists, and cash in on the sales of patches that always follow the sales of vulcanizers.

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15 DAYS TRIAL AT OUR RISK

Any responsible Dealer or Repair man may use a Wedford Savex for 15 Days at our Risk to Demonstrate and prove our Claims for this Scientific Invention—read what Dr. Wolf says—

Dr. A. Stratton Wolff
2818 North Grand Ave.
Saint Louis

September 22, 1922.

The Wedler-Shuford Co.,
3540 Olive St.,
City.

Gentlemen:

I have driven Ford cars for 9 years and have used in my time about every style and kind of invention of the so-called fuel economizers, gas savers and thermostatic carburetor controls which have come to my attention because I have the same desire like all motor car owners, to get maximum power and fuel economy and believe proper adjustment of the carburetor will accomplish this.

About 4 months ago my garage man sold me a Wedford Savex with high recommendations. I decided to fall for it as I did other devices and let him install the Savex.

My observation of the results of your device is very gratifying. It has put new power and speed pep to my engine. When I step on her she seems to go out from under me and I take ordinary hills on high gear.

The party that sold me the device didn't call it a gas saver, simply said it was an automatic carburetor adjuster but I find I use about 30% less gas and oil since installing your device.

I recently drove to Bonne Terre, Mo., a distance of 65 miles through the foot hills of the Ozarks. Most of the trip was made in a heavy rain necessitating travel on low gear but the entire trip was made on 4 gallons of gas.

I made the same trip on previous occasions in fair weather and good roads and used 6 gallons of gas when I did not have the Savex.

The device is working absolutely perfect and I did not realize that such a difference could be in any car through a simple invention.

Your Wedford Savex is to the Ford engine what the steam governor is to steam engines. I earnestly recommend it to Ford owners.

My purpose of writing you is to say that this is one time I was not stung on a new device and seem to get what I and thousands of Ford owners need.

Respectfully yours,

A. Stratton Wolff

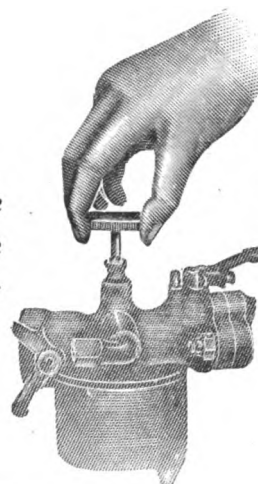
MAXIMUM POWER AND ECONOMY—THROUGH PROPER ADJUSTMENT OF CARBURETOR

The carburetor should be accurately adjusted for a cold engine, a warm engine, a hot engine—level roads, hilly roads and speed.

WEDFORDSAVEX
DOES THIS POSITIVELY AUTOMATICALLY

More
Accurate
than the
Expert's
Hand

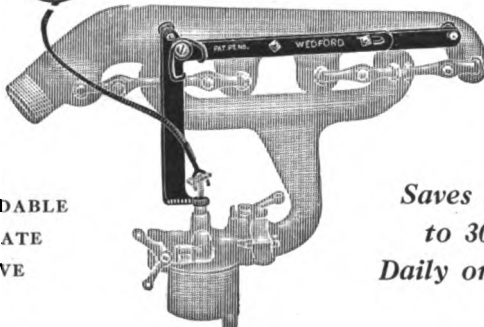
A
Scientific
Invention
that Does
the Work



Sights like
This Un-
common but
not neces-
sary with
Wedford
Savex
Installed.

THE PERFECT SCIENTIFIC CARBURETOR ADJUSTER

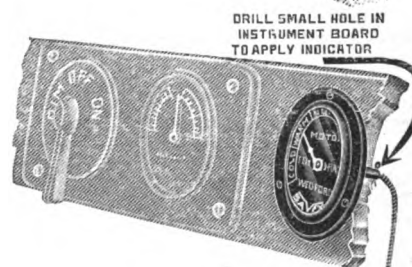
For All Ford Cars and Trucks
TELLS THE MOTOR TEMPERATURE



DEPENDABLE
ACCURATE
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Saves 25%
to 30%
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\$7.50
A SMALL
PRICE
TO PAY
FOR SUCH
BIG SERVICE
VALUE



DRILL SMALL HOLE IN
INSTRUMENT BOARD
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Cross-cut
view show-
ing how
dial indica-
tor body
stem pass-
es through
small $\frac{1}{8}$ in-
hole in in-
strument
board.

Sell your customers continuous and everlasting expert carburetor adjustment service, no matter where and when they drive—good roads, bad roads, light or heavy loads, Wedford Savex will take care of the carburetor and engine always and tell when something is wrong with motor or when oil or water is needed.

Low speed, close throttling and still able to climb all ordinary hills on high gear.

Never an over heated motor—no burned out valves or bearings—it will stop the engine completely if radiator or oil reservoir is empty.

We want you to be sold by actual demonstration at our risk—order a Savex today, use it 15 Days; if it does not do all we claim for it when installed according to instructions (30 minutes to install) send it back at our expense and receive full credit—no other obligations.

The Wedford Savex is Actuated by Expansion and Contraction of the Exhaust Manifold. The Dial Indicator recedes to "cold range" as engine cools off, and Savex mechanism opens carburetor for rich starting mixture.

THE WEDLER-SHUFORD CO.

St. Louis, Mo.

Automobile Dealer and Repairer

The Mechanical Motor Magazine
Registered in the U. S. Patent Office

VOL. XXXIII NO. 9.

NOVEMBER, 1922

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\$1.50 per year

The Auto-Repairman Who Won a Fortune From Wreck

There May Be A Golden Lesson to No End of Good Readers From
the Experiment of a Huge Repair Shop of the American Mid-West

BY FELIX J. KOCH



THIS is the story of an auto-repairman who was seized one summer morning with what he believed to be an extra-good idea, and who set to work, then and there, to put this "idea" into active operation;—who clung to it; developed it; expanded upon the basic germ of it:

and who, today, ranks with the most successful auto-repairers in all the territory between the Alleghany Mountains and the Rockies, or, if you would, beyond.

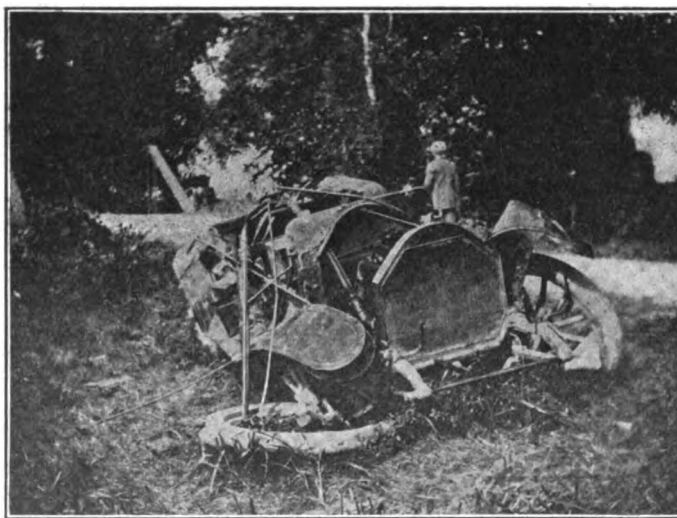
The man's name is Shaw, and down Cincinnati way where Mr. Shaw has his headquarters, and from which he operates his model fleet of wrecking cars, they call him, as a result of advertisements worded in that way, and scattered broadcast, city and country-sides over, "Shaw, the Speedy Wrecker."

"Shaw the Speedy Wrecker,"—or "Shaw the Wrecker," as he's known, for short—believes, for one, that there is no other opportunity to win a client to a repair shop like the time when a man is in trouble.

He believes in what is obvious to probably all who may stop to think of it, that there is never a trouble-time with a motorist—barring illness in his home, and a car that won't budge to go after the doctor—to equal a fair-size wreck.

He believes that when a man is "caught" in a wreck, be it serious or mild, he cannot have his car extricated any too soon to please him and he believes that the peripatetic advertisement that man will give later, telling everyone how quickly the Shaw wrecker-car came to the rescue, after the other fellow hit HIM, is well worth any reasonable expense entailed.

In short, Shaw believes that a pleased customer is the best advertisement, and Shaw believes that it pays to advertise!



Should you thumb the rear of the Cincinnati telephone directory looking through the classified advertisements of auto-dealers and repairers there, you will find that he holds an entire page of space—a brilliant yellow page, surcharged with solid masses of black; this ornamented with a cut of the wrecking-car, and posting a most generous reward, the very

printing of which is apt to excite the viewer's curiosity and cause him to stop, on the moment, and read to the end.

\$50.00

REWARD

FOR ANY AUTOMOBILE WRECK WE
CAN'T PULL IN.

DISTANCE NO OBJECT
OPEN DAY AND NIGHT

Phone Main 5152

Nor does Mr. Shaw stop with just this advertisement. He will advertise, in the territory he considers tributary to his plant, in any and every worthwhile media he may meet.

"It's this way with me," Shaw explained, as we pressed him for the secrets of his phenomenal financial success as an automobile repairman, the other morning, "I say ADVERTISE! I'll go on record any time as being as persistent an advertiser as any man of the craft in the territory in which my repair-shop stands.

"I believe in advertising in the daily papers of the area—all of them; and not simply once, but at least twice a week. I believe that small, or 'classified,' ads of the sort so often found by the column in the daily papers are a waste of money. I take a good sized 'ad,' or I will have none.

"Then, in my advertisements, I believe in pictures. Pictures take the eye as nothing else will. And, in turn, I believe in striking pictures. I have equipped each of my wrecker-cars with a high grade six- and- a half by three- and- a half inch camera, and the men in charge of the cars are instructed to take as many different photographs of every wreck they handle as they may believe interesting to the public at large, or of value to our clients later on.

"From these pictures I make selections, and these selections, reproduced in high grade half-tones, I employ in my advertising. Of course I do not give the name, or other clue, to the owner of the unfortunate car. I believe that people in this locality are already beginning to look deliberately for these pictures. I believe that they will pass the section of the newspaper containing them about, among their friends—*motoring* friends especially, as something worth looking at. I believe they are talking of them. They talk, talk wreck, talk repairs, talk—SHAW!"

"Just why do you make a specialty of wrecks, Mr. Shaw?" we asked, wanting to get HIS reason for this, as conversation was diverted by the return of a wrecker-car with a sorry specimen of a high-grade roadster, which had skidded and fallen twenty feet upon some rocks below a fill of road.

"Because, after investigating the field open to the Anglo-Saxon repairman very carefully, I came to the conclusion that a repairman is advertised best by emphasizing ONE specialty and, after considering all the specialties I could learn of, I came to the conclusion that wrecks made the best I could find."

"It seems to pay you," we ventured.

We had kept our eyes open and watching workmen, engaged in making battered cars shipshape everywhere about.

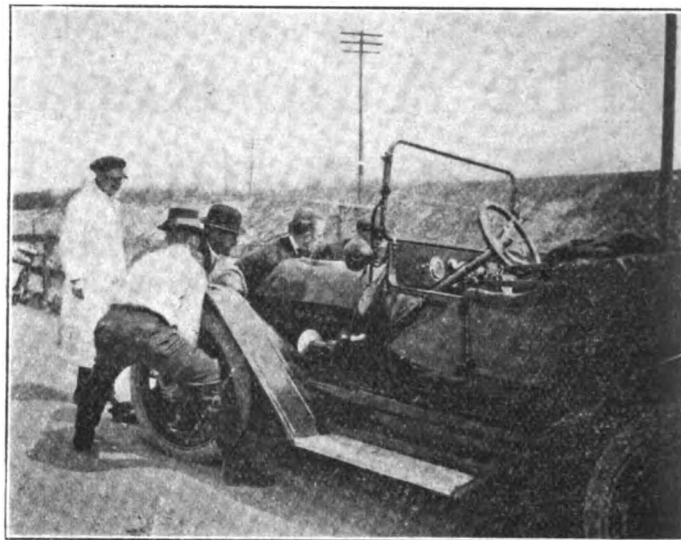
"I am more than satisfied at the venture," he answered. "See some of the wrecks which the good words of pleased customers have resulted in bringing to hand!"

He passed across to us an album of photographs of wrecks handled since the cameras had come. Big cars and small cars, fine cars and cheap cars, ALL were rep-

resented here; and then in all matter of stages of disrepair, from the car whose hub had been "taken" by a passer and which stood out, letter-perfect, except that it was limping;—to cars which had gone into collisions and emerged with it very doubtful whether it would pay to attempt a repair!

"Just how do you handle a wreck, in order to leave a pleased customer in its train?" we continued; meantime thumbing more and ever more photographs of hurt cars.

"To begin with, we keep three of the familiar wrecker-cars ready for instant call always," he answered, indicating the "stalls" for the cars at our rear.



Out of the Road Till The Wrecker Arrives

"We will go anywhere that a client calls; but we rather consider fifty miles from the place our logical area, and we keep the chauffeurs of the wrecker-cars posted on roads, and road-conditions throughout that zone, so that, day or night, fog or sleet or pleasant weather, they know exactly what they are about!

"Assume now, for the sake of an illustration, that you are driving along in a good-sized car, are at the very bounds of the fifty-mile zone, and meet with a serious accident. You've read our advertisements ever so often in the dailies, or you've remarked our posters on the country-side billboards; or—a stranger to the locality,—you *do* what just about everyone caught in such a 'fix' will do, 'hunt the nearest telephone,' look through the directory at the rear of this, and judge the garage to be chosen by what seems to you the most striking ad.

"In short, you telephone us to come at once and 'help you out,' exact repairs to be made, to be determined later on.

"Whether this S. O. S. from you comes at midday or whether, to take a more trying case, it comes at midnight, procedure is the same.

"Blank forms rest squarely beside our telephone, and the operator knows exactly what he is expected to do... Even as he queries you for details, he is putting in writing certain essentials to our records. The exact time this telephone call was made; the name of the person

calling; the home address of the owner of the injured car; the kind of car this may be; the license number, if known to the person doing the telephoning; (where not, our repairmen add this, later on); the nature of the wreck, as far as it has been determined; the leading causes of trouble, why the car will not operate under its own power, that is to say—then, and any other details of possible value to the men to be sent to its aid.

"Our form is so arranged that the 'phone operator has the proper blanks filled with all this information in just about the time it takes the much-excited party at the far end of the wire to tell.

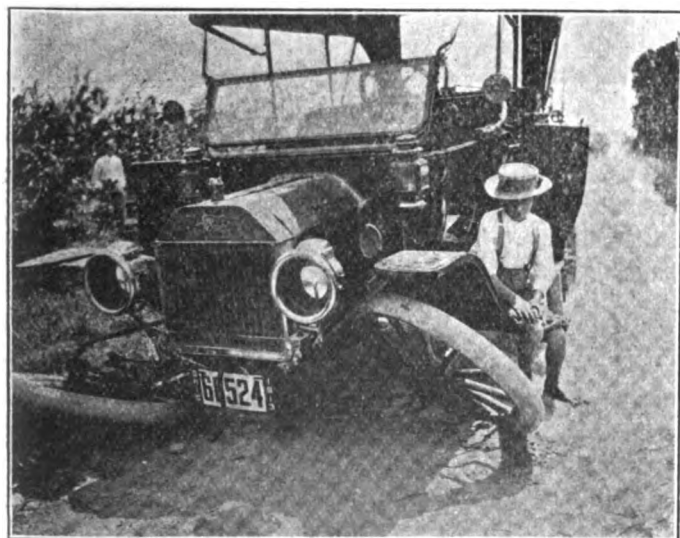
"We maintain a system of 'practice calls,'—of 'drills,' I suppose we should call them;—and, as a result of these, we KNOW that we can have a wrecker car out of the garage, its crew given their destination and as complete an account of what awaits them as we are able to secure by wire without delaying assistance unduly, within three minutes of receipt of the call!

"For the day-service we keep fifteen men available always to such summons.

"For the night-service, on nights which promise the least likely business, we have five men prepared for instant call. Day or night, therefore, we believe we can start a relief car, with as many hands aboard as seem at all necessary, in as short a time after receiving the call for such as any of our competitors in this field!"

Mr. Shaw led us back to the fleet of repair-cars awaiting what he likes to call the "summons."

Each car was equipped, first and foremost, with a six-ton hoist. This becomes the most important single factor in handling a hurt car, after the manner pursued here. Beneath and about the base of this hoist, and at other convenient places about the truck, especially constructed tool boxes contain an almost infinite variety of



Done For?

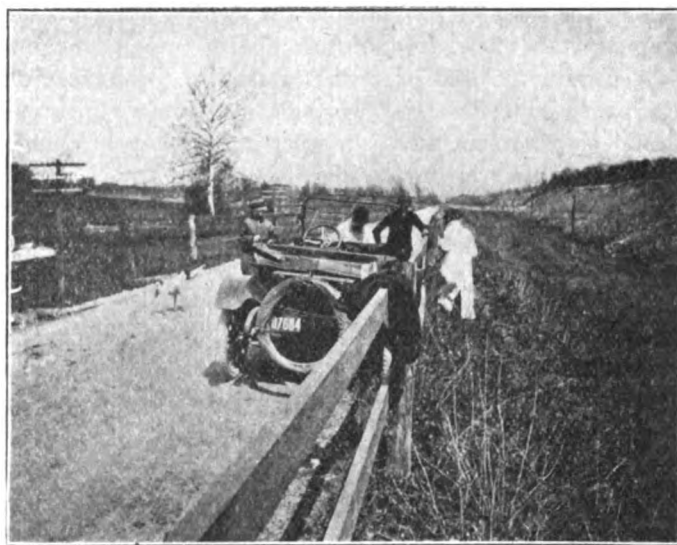
implements which may be necessary to the initial, or roadside, repairs.

"No matter what the actual call may be, the repair-car travels at pretty nearly full speed just as soon as it enters

the less traveled roads," Shaw explained; continuing the story of the example chosen," and this means that it will ride say thirty miles an hour, or, allowing for slowings-down in centers, and things of the sort, it will need never to exceed two hours to reach the wreck at the end of the fiftieth mile."

"And there you may meet—?" we interjected.

"Just any and every kind of motor-wreck known to Man!



Puzzled As To The Trouble

"The worst kind of wreck we may be called upon to handle—the worst from our point of view, the getting the car to the road and back to the scene of repair itself—is the one in which the automobile has gone off the road, continued along, over an embankment; and will be found resting, a sadly jumbled mass, anywhere from seventy-five to a hundred feet below the travelled 'pike.'"

"Which is usually the result of—?"

We wanted to know what the leading authority on motor-car wrecks in this part of the country believed the cause—the BIG cause—of the BIG Anglo-Saxon motor-car wreck!

He laughed, a very little.

"The clients will tell you, in just about every case of the sort, that the car 'skidded.' They will tell you, in the same breath, almost, that there is one crying need of this great and glorious country and that is much increased improvement of its roads. If the roadbed had been what it should have been, 'if things had been such that the car could not have skidded,' it would follow most obviously that—

"But you can guess the rest!"

"You say the clients give this verdict." What do the expert repairmen assign as the basic cause for these tumbles from the travelled roads?"

Shaw winced a little, then answered:

"'White mule,' or 'moonshine,' or call it what you will. Indiscreet use of liquor is, without a doubt, the cause of most of these off-the-road wrecks!"

(Continued on page 36)

Salvaging Valves

BY DAVID BAXTER

FOR the reclaiming of broken, worn, or pitted automobile, truck, or tractor engine valves, there is but little doubt that oxy-acetylene welding is the cheapest and most efficient process. In fact many of these valves can not be salvaged except with the welding torch. And it is true that but few of the general run of engine valves were repaired or reclaimed before the advent of the gas welding process. Nowadays, however, the oxy-acetylene torch operator can work up a quite profitable line of business in the saving of these important motor parts.

The welder may either repair the valves in accordance with his customers special orders or he may gather discarded valves from different sources and repair them as replacements. In other words, he can thus keep a stock of standard repaired valves that are almost as good as new, to sell to any of his customers who do not like to install new valves. And while making such replacements he usually can obtain the replaced valves at very slight cost. This is an important part of the idea of salvaging valves, because he can then use the old valves in the repairing of other valves as will be explained later.

The idea of salvaging discarded valves for the motorist trade is particularly suited to the garage having a welding outfit in connection with its motor repair department. But the man who operates a welding shop solely is not barred since the automobile industry furnishes a very large percent of the welding repair work today. The main thing is to advertise the fact that valves can be satisfactorily repaired.

But let us see what some of the most important valve repairs are, and how this work is done. Take first the commonest instance: the welding on of a new stem. Which is handled in two ways: one by welding on a piece of new stock steel cut to the proper length; the other is to use the stem of another discarded valve but of larger size.

In both instances the piece to be welded on should be larger than the stem to which it is to be attached. That is, both the piece of new stock and the discarded valve stem should be enough larger than the original stem so as to furnish plenty of stock metal to machine to desired size. Particularly the discarded stem should be larger since it is liable to have worn spots or pits that must be machined out in making accurate the new valve.

And here is where the salvaging idea comes in: When the stem of one valve is cut off it should be preserved for use on a smaller valve. In other words, the stem of the larger valve should be kept to use on the smaller sizes. This eliminates the necessity of purchasing new steel for every job, and therefore enables the welder to cheapen the cost of the work. He should be careful though in cutting off the old stems to not waste any of the stem,

because there are such a variety of valve stems that even a quarter of an inch in length will prohibit the use of an old stem. When cutting old stems to save for future use they ought to be sawed as this wastes the minimum amount of their length.

In detail the replacing of worn valve stems may be accomplished as follows: First, saw off the worn stem



Fig. 1, Showing The Double-V Idea

a couple of inches below the head; or as close as the worn portion will permit. Then cut the new piece of steel, or saw a sufficient length of a discarded stem to the correct length. Then if measurements work out right the welder may kill two birds with one stone, as the saying goes, by grinding the stem in two with an emery wheel. He holds the stems against the square corner of the wheel until the rod is cut about half way through. Then the stem is turned over and the grinding is repeated on the opposite side of the rod. This cuts a wedge shaped end on both parts of the stem, such as is shown in one of the pictures. Or the welder may saw off the stems and then grind the ends of the part to be welded on to another head, to a blunt wedge. Also grinding the part of the old stem that remains on the valve. If a new piece of stock steel is to be welded on he will have to grind one end of it anyhow.

This wedging must be done to provide a V-groove for

the welding. It is to enable the welder to fuse the full thickness of the stem without so much danger of burning the metals. Many valves are made of special steel, which burns or oxidizes extremely easy under the intense heat of the welding flame. And, as it often happens, the torch operator doesn't know the exact nature of the steel of which any particular valve is made.

Which brings up another good reason for utilizing discarded stems to repair other valves, viz.: the welder is more liable to weld on stems of the same steel as the valve he is repairing than he would be to weld on a piece of stock metal.

But to revert to the wedging or grooving of the seat portion of the stem and the new part: It is better to have a groove on each side of the stem than it is to grind the stem all on one side especially if the stem is quite large. The weld is not only easier made but the stem will be straighter, due to the pull of contraction being equally divided. If the weld was made all on one side of the stem the contracting weld metal would be pulling all one way to result in a crooked stem. Of course the stem could be heated and bent back again but it is better to weld it straight in the first place. The exception to the rule being in the case of very small valves, which are no doubt handled as well with a single groove weld.

Fig. shows quite clearly the double-V idea in the valve stem which the welder is holding in his hands. Notice that both parts of the stem are wedge shape where they join to form the V-grooves. Notice also that the stem to be welded on is larger than the original stem, as previously recommended.

The wedges on both parts of the stem should be carefully ground so they will terminate in a line very nearly straight across the center of the diameter of each. Then, when the two are fitted together the larger will align with the smaller to produce a straight stem when the welding is finished. Or it will at least be near enough in alignment that it will machine straight.

After attending to the grinding of the stem parts, the next step is to place them so the welding can be handily accomplished: In this particular instance the stem parts were welded on a machine faced leveling plate, which formed the top of a small welding table.

This table may be made in any welding shop and is readily constructed of discarded pipe and angle iron securely welded in shape. The top is of cast iron approximately two inches thick. It has holes and slots through it, especially arranged for the handling of small jobs such as this valve.

This valve was placed so the head rested in one of the slots while the stem lay flat upon the leveling plate, a position which is clearly indicated in two of the accompanying photographs. It will be seen also that the salvaging idea is further illustrated by several other valve stems on the table.

After the head was placed in the slot a small weight was arranged back of the face to prevent the valve from tipping out of line. Several strips of asbestos paper were

inserted beneath the smaller part of the stem. These served to raise the wedge of the smaller up level with the wedge of the larger stem part. The strips were also wide enough to extend beneath the grooves and protect the table top from the intense heat of the welding flame during the fusing operation. Once the welding was started, though, the asbestos strips were not needed to hold the stem parts in line since the weld metal was sufficient to hold them.



Fig. 2, Showing Position of Valves on Table for Welding

By placing the valve head in a slot and the stem on the flat table the operator could roll the job over without trouble in keeping it aligned. Which could be done, however, by having the head protrude over the edge of the table after it had been fastened with a drop of the weld metal. In the case of large valves such as are used on some tractor engines, the operator can employ V-blocks to keep the stem in line. The V-blocks will permit the weld to be turned over and at the same time preserve its alignment.

When the aligning arrangements were all made the next step was the actual welding of the new stem; a matter requiring some consideration since the welder must select a flame in accordance with the size of the weld. That is, the larger stems require large welding flames, with smaller flames for smaller stems in proportion. Of course the operator who is expert can employ a flame which may be theoretically too large or too small for the given job. But it is better to use a flame in accordance with the torch manufacturers printed table of instructions.

In this particular instance a little below medium size flame was employed, the condition of which was strictly neutral; in other words, it consisted of equal proportions of oxygen and acetylene gas. Had it carried more oxy-

gen than acetylene the melting steel would have been open to oxidization. This excess oxygen would not be consumed by the flame and would therefore be liable to be injected into the melting metal. The melting steel would absorb the excess oxygen to turn the metal to oxide; to burn up the metal, literally speaking. Which would render the weld brittle and porous, almost devoid of strength and machineable quality. While an excess of the acetylene would have lowered the temperature of the flame and at the same time hardened the weld, making it unfit for satisfactory service.

Acetylene gas is rich in carbon, so that an excess of it in the flame would have, in this instance, tended to carbonize the weld. Therefore, the welder endeavored to keep the flame strictly natural so all of the oxygen and carbon would be consumed by combustion.

The tip of this white neutral cone of flame was brought close to the upper groove in the valve stem. Here it was played slowly back and forth until the groove bottom started to melt and flow. As this occurred a mild steel filler rod was brought close to the heating weld to be introduced the moment the groove bottom commenced to flow. This rod was one-eighth of an inch in diameter; a larger rod would have required too much heat to melt properly in relation to supplying the correct amount of filler to the melting groove. On the other hand it would have supplied too much filler for the melting capacity of the weld; a rod too small, or smaller than eighth of an inch in diameter would be too easily burned and would supply sufficient filler to mix properly with the melting stem metal. As in the matter of selecting the right size flame the filler rod should also be selected according to the weight and thickness of the weld.

As the groove bottom melted and flowed together the heated end of the rod was twisted into the molten bath. Then the flame was played upon the rod and groove in such manner as would produce a unified melting. The rod was kept continually in motion, twisting and prodding gently, to mix it thoroughly with the weld. It was not permitted to drip but was fed into the weld by direct contact. The flame also was in almost constant motion, advancing, retarding, and revolving as the melting condition of the weld required. No flux was employed but the filler rod was sometimes used to flirt bits of molten slag or oxide out of the bath.

The flame and rod were thus worked in unison to fill about half of the groove with new metal. Then the valve was quickly revolved or turned over by rolling it along the table top.

When the other groove came upward the flame and filler were applied to it about the same as to the first groove. Half of this groove was filled with the same torch and filler manipulation as was employed on the first groove.

Then the valve was again revolved to bring the first groove upward again to fill the last half of it. This was done much the same in manner as the first, except that a larger area had to be covered, which required a little different flame treatment. Also a surplus of filler metal

was built up above the surface of the stem, thoroughly soaked into the stem metal around the edges. This soaking was accomplished by allowing the heat of the flame to settle into the metal rather than to try to force it in by holding the tip of the white cone close to the weld.

As soon as his surplus metal had congealed enough the valve was once more turned to bring the last half of the second groove upward. The bottom of this was again opened up by passing the flame along it. Then this weld was finished in practically the same manner as the first, even to the soaking of the surplus filler.



Fig. 3, Building Up End of Valve Stem

After which the valve was allowed to cool naturally and taken to the lathe where it was cut down to accurate size. And thus we see a valve was saved and a head and stem were left to be used on another job. Fig. 2 shows the welding in operation on the first groove with the filler rod and flame in contact.

Now another example is shown in this picture, which consisted of building up a little metal on the end of a valve stem. The melting process was virtually the same. The neutral flame was played around over the end of the stem until it started to melt; then the filler was applied by playing the flame over the stem and rod, alternately, until a sufficient quantity of new metal was built up. The valve was in an upright position while this was being accomplished. But when sufficient metal had been added the valve was placed horizontal upon the table with the welded end protruding over the side to enable the welder to add a slight surplus of filler around the stem as machining stock.

(Continued on page 47)

Hard Starting in Winter

Lack of Knowledge The Chief Cause of Most of Our Difficulties-When the "Choke" Becomes An Evil

BY W. G. HULL

WITH the rapid approach of colder weather, the average man begins to get all sorts of questions about anti-freeze mixtures, storing batteries, tires, and what not. Winter weather forecasts bring along the anticipation of difficulties in starting to the man who uses his car the year round. These anticipations are usually the fruit of past experiences. The difficulties are being pretty successfully combated by modern inventions and devices.

The closed car has made winter driving much more popular, and much more general than ever before. Windows readily adjustable; heaters for very cold days; garage heating equipment and other up-to-the-minute appliances have all done their part to make year round use of the automobile more than uncommon.

Nevertheless, for a large proportion of drivers, hard starting is always looked forward to as a necessary accompaniment to winter driving. This is the season when the "choke" is used to best advantage, and figuratively, it may be said that a good many of us choke the engine to death in the effort to make it come to life.

Because so many of us lack accurate knowledge of what makes an engine hard to start in cold weather, we are prone to misuse the "choke." This device is an excellent remedy for hard-starting trouble, but the fact that we do not properly understand its manner of functioning, often makes an evil of what should prove a worthy aid.

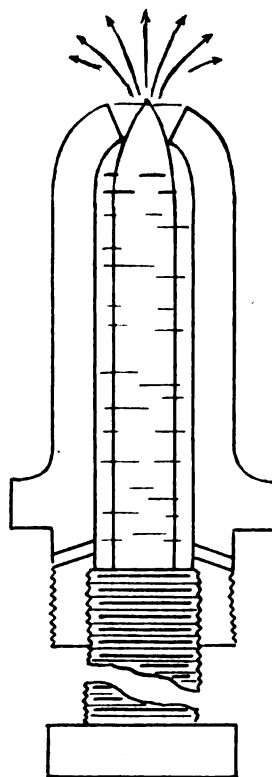
When the motor car first created a demand for gasoline, the quality of the fuel obtained was altogether different from that so generally supplied today. The volatility of gasoline used so extensively today is far below that of the fuel we used some fifteen or more years ago. Then gasoline was a by-product in the production of kerosene. Today gasoline is the chief aim of oil producers. Because so much more gasoline per barrel of petroleum is desired, the product is not so volatile as formerly supplied.

The gasoline of today will not evaporate as readily as the old variety. This, of course, is the reason underlying all, or nearly all of our hard starting trouble, for "gas" and not just gasoline is what we need to run our engine.

VAPORIZING THE FUEL

Modern design has done much to aid us. There are quite a number of carburetors on the market that will "vaporize" the gasoline, mix it with the proper proportion of air and deliver it to the combustion chambers of the engine ready for ignition. The more volatile the gasoline, the more easily and efficiently the carburetor will function.

Gasoline will act very much the same as water. It will evaporate much more rapidly when hot than when cold. When it is observed how small an opening is provided in the spray nozzle of a carburetor, which is intended to atomize the gasoline to an extent that will cause it to more readily mix with the air, it will be appreciated how much the factor of volatility counts. This spray nozzle opening is about the size of a pin hole, and in warm weather, or when the engine is hot, it serves its purpose admirably, but in cold winter weather its task becomes more and more difficult.



The illustration shows a spray nozzle, greatly magnified

Here is where the choke and its misuse becomes of importance. Naturally, the first thing we do on a cold morning is pull out the choke. This shuts off a large portion of the fresh air from the carburetor, and results in a rich charge of gasoline being drawn into the cylinders. So we have a fuel in the engine and it ought to start! But no, we forget that it is "gas" we want and not simply gasoline. We must vaporize the fuel, and this takes time, or heat, in cold weather. If we keep up this "choking," we soon have the cylinders in the condition called "flooded"—a lot of gasoline but no proper mixture of explosive "gas." This is a very harmful condition. Some of the gasoline will leak

down around the pistons, cutting the oil coating on the cylinder walls, and finally dripping into the crankcase where it mixes with the lubricant and is apt to cause considerable trouble or injury.

Specially designed carburetors, with fuel heating chambers an integral part of the casting, have proven very satisfactory. There are a variety of designs on the market. Some are water jacketed, and these usually keep the fuel at a desirable temperature. Then there are various attachments for heating the spray from the nozzle, as it enters the intake manifold, thus inducing vaporization and assuring a proper mixture for the combustion chamber.

Probably the one sure preventative of hard starting is some means of keeping the engine always warm. A heated garage, or some one of the various types of heaters offered for sale will do the trick. Some heaters are designed to keep the entire engine warm and some only to heat the water in the radiator. Radiator shutters and radiator covers serve to retain the heat for a limited time.

ANTI-FREEZE SOLUTIONS

The danger of freezing circulating water is an accompaniment of other winter trouble, and also something to be guarded against. There are a number of anti-freeze solutions obtainable, but undoubtedly the best medium is denatured alcohol. Wood alcohol may also be used, but it is much more expensive, and, as it evaporates faster than the denatured more of it is required. The use of denatured alcohol makes it unnecessary to drain out the water at night if the car is left in a cold garage. It also prevents freezing when the car must be left standing outdoors during the day for any considerable length of time.

The figures given on this page show the temperatures at which mixtures of alcohol and water will freeze. In order that you may be sure that there is enough alcohol in the water at all times, it will be necessary to make use of the hydrometer, which will show the condition of the mixture. The hydrometer used for this purpose should be calibrated to show readings down to 0.9250. The type of hydrometer ordinarily used for battery testing does not read down so far.

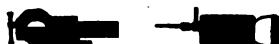
NON-FREEZING MIXTURES

Water	Alcohol	Freezes at about
90 per cent	10 per cent	25° F
80 " "	20 " "	10° F
70 " "	30 " "	— 5° F
60 " "	40 " "	— 20° F

Equal parts water and alcohol freeze at about 18° below 0.

Glycerine and water in equal parts give about the same results as alcohol and water, except that when the temperature drops below zero it gives much greater protection.

Dealers and garage men who sell denatured alcohol to their customers should make a point of using the hydrometer test in order to satisfy their patrons of the efficiency of the mixture in their cooling systems. It will pay you to render such service gratuitously.



Self-confidence is a quality it will pay any business man to develop. But don't get this quality confused with over-confidence, which has wrecked many a business.

* * *

"My daughter sprang from a line of peers," said the ardent father.

"Well," said her feller, "I jumped off a dock once myself." —*The Naval Monthly*.

Interesting Automobile Statistics

LATEST automotive statistics indicate a 1922 production and sale in the United States of over 1,800,000 cars. This is in excess of even the most optimistic estimate made earlier in the year. In spite of the scrapping of 1,100,000 cars during the year, there will be a clear gain to the industry of over 600,000 cars. On this basis, replacement markets alone for the next five years will require more automobiles than were built during the past five years.

In the manufacture, sales, and service branches of the industry, and almost equally divided between them, are three-quarters of a million workers. Another million more are employed in allied industries directly dependent.

The automotive industry today is the largest among America's manufactories. It is bigger than oil, meat, lumber and iron and steel. Only agriculture exceeds it. One out of seven wage earners get their livelihood from it. The 1922 business will reach the astonishing total of two and three-quarters billion dollars. Of this total, according to Miller Rubber statisticians, tires represent approximately \$700,000,000.

In passenger miles for the year, the automobile should have two against the railroad's one. Its seating capacity is twenty to one of the railroad coach.

One in every three bales of cotton go into automobile tires. Four out of every five pounds of rubber are used for them. Eighty percent of the five and one-half billion gallons of gas produced for the year will be required to run the eleven million cars registered today.

See America First

"**S**EE America First"—is ceasing to be a mere watchword, a slogan, a hope of those few "boost" organizations that burned with the desire to tell all other Americans what things of absorbing interest their own country held for them. It is becoming the rule of existence—at least the vacation-time rule of life—for scores and scores of thousands who once thought sight-seeing and travel meant only Europe.

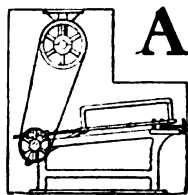
It appears from facts furnished by the National Park Service of the Department of the Interior, that the American people are rapidly coming to an appreciation of the western wonderlands that have been preserved to them in their primitive character while the rest of the country is being devoted to commercial, industrial and agricultural development—to material progress of all kinds. It has been figured out that approximately one person out of every thousand in the United States, enjoyed the privilege of touring the Yellowstone National Park during the season just closed.

There is a big demand for the things not to be had.

Do You Tell the Whole Story?

Omitting the Price Leaves the Sales Talk Incomplete, and While It May Produce More Inquiries, Resulting Sales Are Apt to Be Disappointing

BY A. B. CASSETT



ADVERTISING either is or is not an aid to business.

If it is a power for good, then whether business is dull or rushing doesn't make any difference.

If, on the other hand, advertising is a waste, this in itself is sufficient reason to do without it.

That advertising is a power for good is a recognized fact, at least by the hundreds of manufacturers who are daily utilizing this force. That a lull or rush in business doesn't alter the situation as far as the value of advertising is concerned is well illustrated by the fact that these advertisers are continuing month in and month out despite change in time and conditions.

What possible bearing can one's present condition of health have on the question of the value of life insurance?

Speak in specific terms when talking to customers through the retail advertisement—leave the flossy stuff to the other fellow.

Speak of good merchandise, good garage service and good square prices; leave the fake stuff alone to stand out sharp and clear in contrast to your convincing copy which rings true in every line.

Remember if you are running an accessory store along with your garage that a continued succession of special sales brands a store as a sensational one, a store which plays too hard the special price in order to more than make up on unadvertised articles which give padded profits.

The public knows full well this policy and has gotten into the most annoying habit of purchasing the advertised leaders and making for their homes with eyes shut to everything else. This fact is true to an extent making sensational marking down practices absolutely dangerous to immediate profits as well as detrimental to store reputation. A price reduction of modest proportion is believed. One of great proportions creates one of two results: the statement "fake" or an investigation, which, if it proves the price quotation verifying the reduction claimed and the quality up to the stated grade, a purchase and as told above an exit from the store without further purchasing.

Use a distinctive font of type, one that shall be different from all other advertisers and immediately associated with your house. Advertisers who are afraid to name the price of their product never get any of my money, and really it's amazing to note how many ads

omit this important item. In some cases it is excusable. If a man is pushing an accessory in which many styles and models at various figures are included, it is obviously impractical to state prices. But in the majority of instances the advertiser is afraid that the price will frighten the prospect away, he plays for inquiries, hoping that the additional data given in his follow-up or by his salesman, will excuse the price.

The first question asked by every sane, living buyer; be he pauper or plutocrat is "what's the price?" Answer that question and, if he's interested he'll become a possible patron. Fail to answer it and be rejects: "Well, if I knew the price I might be interested. But it must be mighty steep or they'd have named it. I guess I won't do anything at present." Omitting the price may increase the number of inquiries, but I'll bet you ten to one that it decreases the number of live inquiries. Watch your own individual reaction to advertising! If an ad or window display catches your eye you read a few words of the inscription matter and then, if sufficiently inter-

We Can
Sell You

A TIMER

That Will Stay on the Job

Give your car
a new lease of

LIFE!

We have Timers from \$1.50
up to \$5.00

Royal Garage

84 Hill St. - Sticktown, Vt.

ested, promptly drop your glance to the bottom to ascertain the price or price range. If none is there, you turn to something else. But if the price is named and

it is within your limit, you turn back to reread the text or re-examine the window.

In my opinion, omitting the price kills interest and creates suspicion, if not actual hostility. In some people curiosity, is so lively that they would investigate further, price or no price. But most people are too busy to bother with a matter when they don't know whether or not the

feature, fully justified the additional expense, and gave the community a live little newspaper which they appreciated and in return for which they gave the store their trade.

The paper made no pretence of being artistically arranged or typographically perfect, but it did give the neighborhood news and was free for the use of those who wanted to advertise anything for sale, or use its columns in a general way.

The advertising matter was always printed on one side and the reverse side used strictly for news items. The idea brought a substantial increase in business and profits. Advertising forces your business to its proper growth and keeps it growing. When a business stops growing it soon goes backwards. It is governed by the same principles that govern a plant. A plant improperly cared for, soon will wither and go to seed. A business that is permitted to take care of itself soon follows the course of the neglected plant.

Big men who do millions of dollars worth of business every year always are looking after the small things. They are scheming and figuring out how the million dollar business of today may be broadened to a million and one dollar tomorrow. They are not content with letting

When Pedal Pads

Wear Smooth

Look out, lest your foot slip !
You can get

A New Set

For \$1.50

Royal Garage

16 Crescent St., Newville, Mass.

price would render it worth their time and trouble.

In very small towns odd methods are often taken advantage of for the purpose of securing business.

A progressive in one of these small towns in the West conceived an advertising idea which has built a very profitable business, in fact, has given him much more trade than one would suppose possible to get in a rural community. As this town had no newspaper, the garage and store had for some time been issuing a circular which was printed in a neighboring town which had a good newspaper plant. The circular worked very well, but the big city idea and the one that brought the business, was conceived by the merchant in his desire to print a newspaper in his own town.

Increasing the size of his circular somewhat he began to print local news items on the back of the circular. If Bill Smith had a loss by fire, or if the Sunday School gave a picnic, on account of the affair was sure to appear in the store circular, so that within a short time this circular came to be eagerly sought by the people of the community, with the result that the mailing list doubled within a few months and the circular began to bring new business to the store.

The cost of the paper and circular amounted to \$30 per month, including mailing, and the increase in business the first year of its use after adding the newspaper

REAL ECONOMY

Consists of getting the most
power at the least cost.

THAT NEW

CARBURETOR

IS HERE

\$10.00

Come in and look
it over.

ROYAL GARAGE

68 Main St., - Goodtown, N. J.

the business run itself, because from experience they know it won't do it. They have to keep their fingers on the details that bring in the pennies and the quarters. They know that once the small coins begin coming in the millions will accumulate. They say: "We won't let this business of ours go to seed. We will care for it as we would for the plants that decorate our porches at home and our back gardens. Keep the weeds pulled and the business garden free of anything that tends to deaden it."

Battery Service In the Public Garage

Some Pointers for the Live Wires Who Are Building a Permanent, Profitable Business

BY CARLE WALTERS

THE car owner who stores his car for the winter, either in his own private garage or with the garage man in his town, is just about now getting all kinds of advice and gratuitous instruction, from interested friends, as to how best to put away his storage battery. A good many owners fight shy of the battery service station, chiefly because they have been warned by solicitous fellow-car-owners, who really don't know what they're talking about, that the battery man will find several things wrong with his battery, and instead of a moderate charge for simple storage, there will likely be a big bill for overhauling and repairs. Any battery service man who does not fight this situation determinedly and conduct an intelligent, industrious campaign to secure all the storage business to be had in his territory, is simply overlooking a very profitable line of trade. He is destined to learn by experience, perhaps, that what is worth having is worth going after. Wet and dry storage methods both have many advocates. It is up to the battery man to enlighten prospective customers on the general subject of proper storage, and to inform them when and why either "wet" or "dry" is to be preferred.

Batteries brought in for storage should be carefully looked over, special attention being given to the condition of the case, terminals, sealing, etc. Inquire how long the battery has been in service of owner. Batteries less than a year old, in good condition, which are not to be stored for more than six to nine months, can be put in "wet" storage. If more than a year old and in good shape, it can also be put in "wet" storage, if it is not to be laid up for more than a few months; otherwise it should be put into "dry" storage.

After giving the battery the "once over," bring the level of the electrolyte up to proper height by adding distilled water, put it on charge until fully charged, meantime watching for any developments, such as abnormal temperature rise, or failure of voltage or specific gravity to come up to proper point. If everything is O K put the battery on discharge at a rate which will cause the voltage to fall to about 1.7 volts per cell in three or four hours. If the voltage of one cell drops more rapidly than that of the others, it is an indication that some defect exists and the cell should be opened for inspection. If all cells drop to 1.7 in the three or four hours, the

battery should be put into dry storage. After the discharge test, recharge the battery fully, no matter which form of storage is decided upon. When dry storage is decided upon, then attention of the owner should be called to the condition of the battery, and he should be informed that it will deteriorate if put into wet storage. He should be acquainted with the requirements of dry storage, and this will avoid any misunderstanding regarding the expense involved in reassembling the battery when it is taken out of storage in the spring. Progressive battery service man would do well to adopt some form of agreement for storage and care of batteries, which of course should be signed by the owner.

WET STORAGE

A bench of strong shelves should be provided for batteries in wet storage. Bench or shelves should be provided with wood runners, or strips, so that batteries will not rest directly on the surfaces of storage space. Cables not burned on should be removed from the battery and vaseline spread over the terminals.

To facilitate charging it will be a good idea to arrange wiring in such a manner that the batteries may be charged where they are stored. If this is not possible it will be necessary

to put the batteries on the charging bench occasionally. With the bench charge method, water should be added once a month to replace evaporation, then give the charge. Before the battery is delivered the high rate discharge test should be made on it. When putting the battery into service be sure to see that electrolyte is up to proper level and that the specific gravity is at 1.280 to 1.300. Batteries in wet storage may also be connected in series across a charging circuit, with one or more incandescent lamps in series with the batteries to limit the current. This enables you to charge the batteries continuously at a low rate, and renders it easy to put the battery into condition for service at short notice. Water should be added about every six weeks.

DRY STORAGE

After giving the battery a complete charge, pour out the electrolyte. If the positives are not buckled to any extent it will probably not be necessary to separate the groups. When positives and negatives are not separated, each element should be washed carefully. Then remove

The garage with proper equipment, plus the determination to reach out for every legitimate profit in sight, should not pass up the opportunity of securing new business from the man who is now perhaps buying nothing but "gas" and oil. If there's a good battery man in your locality, co-operate with him; if there isn't one, now is the time for you to make one.

plates, drain and dry them thoroughly. If the negatives heat up when exposed to the air, they should be immersed in water again, repeating this process until the tendency to heat up is eliminated. Then dry them thoroughly. Clean terminals carefully and wash out the jars. Washing out the box with a solution of baking soda is a good idea.

When the plates are dry, they may be nested together with cards in between and replaced in the jars.

When the battery is to be delivered, new separators should be put in, the elements put in jars and the covers sealed. The cells should be filled to the proper level with electrolyte and the battery allowed to stand for about twelve hours to cool off. It should then be charged at about one-half the normal rate until the specific gravity of the electrolyte stops rising and remains stationary for about four to five hours. This will require possibly three or four days. Should the temperature rise as high as 110° Fahrenheit, the charge should be stopped while it cools.

Because of the new separators the specific gravity will likely fall during the first of the charge; at the end of the charge the specific gravity should be 1.280-1.300; if it is not within these figures, some electrolyte may be taken out and water added if the gravity is high, or 1.400 electrolyte if it is low. Before delivery give the battery a high rate discharge test. This test consists of discharging the battery at a high rate for not more than twenty seconds, which will not exhaust more than about three per cent of battery's capacity. Voltage readings should be made while the test is on. Hydrometer readings are also necessary in connection with this test, or incorrect indications may occur. The rate of discharge required is only enough to surely show up short-circuited cells or cells of low capacity, and poor joints.

Winter Car Storage

EVERY car brought to your garage for storage should receive careful attention, in the presence of the owner. Look over the running gear and see that no parts such as oil or grease cups are missing. If they're not all there when the owner calls for his car in the Spring, the loss will likely be charged to you. By making a point of carefully inspecting all cars brought in for winter storage, and checking up their general condition with the owner, you not only impress him with your quality of service but also safeguard yourself against any possible charge of neglect or carelessness. Give the owner a receipt for the car and whatever equipment is left with it.

If the car is for dead storage, it should be given special attention. This may take some time, but it will be time well invested for the garage owner. The car should be carefully cleaned, inside and out. Water and gasoline should be drained out. Time will damage a car as well as hard use.

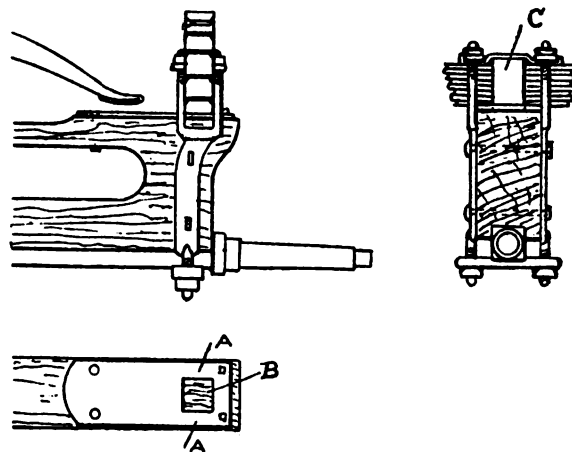
Grease all polished brass or nicked surfaces, and don't overlook those on the instrument board. A little grease

or vaseline on all electric terminals is a good thing, too. If seats are upholstered in leather, give them a light linseed oil coating.

All of these things take time, but no car owner will complain of a proper charge for putting the car in commission in the Spring, and this charge will automatically cover the time spent in putting the car up. It will not be a lengthy job to put it in commission. Assuming that the battery has been removed and sent away for either dry or wet storage, it only remains to put a cover over the car to keep out dust and dirt.

Fixing Truck Springs to Bolsters

A WEAK spot in heavy trucks, as usually made, is the connection between the spring and rear axle bolster. There is not sufficient substance in the wood itself to withstand the heavy strains. Accordingly, it requires to be reinforced in some way in order to counteract the tendency for the clips to loosen and the bolster to split at the ends and get out of the perpendicular. Among various means adopted is that shown in the accompanying sketches, says The Coach & Motor Builder, which has the merit of simplicity besides being effective, both in a new job and in re-setting up an old one which has come in for repair.



A plate the width of the bolster and about $\frac{3}{8}$ of an inch in thickness, is made to go over the bolster, being fastened on with bolts or coach screws, or both. A square, B, is cut out to enable the buckle of the spring, C, to fit in neatly, the two edges, AA, being slightly hollowed to make a seating for the bottom plate of the spring which rests on it.

In the case of a repair job, in which the wood has splintered to some extent, the plate can be doubled back under; thus giving twice the thickness of metal under the spring bearing, the bolster being reduced in depth in order to give the plate a level seating. The plate extends along top of bolster far enough to take the wear of cross spring where the latter is used.

As shown in the sketch, the clips have slots cut to take bolts with which they are bolted to bed. This is done to provide for shrinkage of timber and consequent screwing up.

Case Hardening of Steel

Use of Powders—Methods of Heat Treatment

J. F. SPRINGER

What we are interested in at this moment is the *yellow* prussiate of potash (potassium ferrocyanide). It is to be finely powdered. Then it is sprinkled over the surface of the heated work. The proper heat is a *red*. After the powdered yellow prussiate of potash has been sprinkled over the red-hot metal, the latter is put back into the forge and the work heated until all the powder has been melted. Then, the work is quickly immersed in water.

Sometimes, it is not even necessary that the yellow prussiate of potash be pulverized to a very fine powder. However, it is to be pulverized enough to justify calling the result a powder. In other words, I am distinguishing between a very fine powder on the one hand and a powder on the other. The work is first heated up to a temperature between a *cherry red* and a *light red*—that is, to 1472 F. and then it is immersed in a mass of the powder. However, the work is to be well polished before it is heated or immersed. Do not overlook this point. When the polished and heated work has been moved round and round in the mass of powder until the powder is everywhere, it is put back into the forge or the furnace and heated up again to the same temperature as before. It is again thrust into the mass of powder and turned round and round. The idea is to build up a fairly thick layer of the yellow prussiate of potash. The heating followed by the turning in the powder may be done quite a number of times. As a rule, however, enough powder can be gotten to adhere to provide for the impregnation. After a good coating has been built up, the workman heats up the article until the coat melts. It is then immersed in water. The temperature of the work at the time it is thrust into the water may properly be in between 1472°-1562° F. That is, it should be at a *light red* or perhaps at a slightly lower heat.

A very important point is now to be mentioned. When the article is first heated for the purpose of getting a coating of the powder, care should be taken that no oxide forms on the metal surface. If such oxide does form, there may be considerable trouble in getting the proper impregnation of carbon later on. If the workman is properly careful as to two things, he may expect success. (1) The heating is not to be overdone. If the heating is done in a forge, then (2) the air blast is to be operated quite gently, and if necessary, the work is to be protected against the air "by pieces of coal or even by means of an iron tube." If the tube is used, the work is put into it.

The foregoing account of case-hardening is concerned with the use of the yellow prussiate of potash (potassium ferrocyanide). The same method may be employed with

mixtures made by mingling the yellow prussiate of potash with potassium cyanide, potassium bichromate or ammonium bichromate.

There are two mixtures which may be used in the powdered form in one of the foregoing ways. These are:

(A)	Potassium cyanide	5 parts
	Sodium borate	2 parts
	Potassium nitrate	2 parts
	Lead acetate	1 part
(B)	Animal charcoal	20 parts
	Horn filings	6 parts
	Potassium nitrate	8 parts
	Common salt	40 parts
	Glue	5 parts

Either (A) or (B) is to be employed in the form of a powder and in accordance with methods already described. That is, the article is to be heated, say, to *redness*, and the powder then sprinkled on. The piece is heated again, if necessary for the purpose of adding to the coating of powder, and then sprinkled again. This operation may be repeated a number of times, if the case seems to require. At the last heating, the temperature is pushed on a bit in order to make the powder melt. The article is quenched as soon as this occurs.

I will now give another formula from Giolitti:

(C)	Calcined horn scrapings	16 parts
	Cinchona bark	8 parts
	Yellow prussiate of potash	4 parts
	Potassium nitrate	2 parts
	Common salt	4 parts
	Black soap	30 parts

One mixes these ingredients in a mortar, using a suitable pestle to mix up and grind up the various things. The idea is to form a paste. This paste is then allowed to dry. The product is ready for use, except that one has to get it into the form of a thick liquid. This is done by taking a suitable amount of the preparation and mixing it with a little water. The remainder may be used another time. The thick liquid is spread by means of a brush over the article or articles which it is desired to case-harden.

The foregoing receipts for making a varnish or a paste or a powder, which is then to be spread on the article, are probably unequal in value. The complicated ones are not, necessarily, better than the simpler ones; and all, except those especially recommended in so many words, are passed along to the reader for whatever they may be worth.

The thickness of the shell obtainable with a *varnish* will generally be quite thin. Perhaps, it may be no thicker than 0.002 inch. It is scarcely likely, even under good circumstances, to be thicker than 0.006 inch.

HEAT TREATMENT In Connection with Case-Hardening

The *heat treatment* of articles that are to have an excessively hard shell is very important. If the reader has been accustomed to impregnate the work with the carbon and then *with the same heat* to do the quenching, he is undoubtedly—except in very special cases—getting inferior results. If what is wanted is a very hard shell on the outside and a comparatively tough core, it will generally be necessary to apply a proper heat treatment.

Let the reader think this over. Then let him resolve, if he has been managing things to less than the best advantage, to do the work right. The apparatus which he uses in ordinary hardening, tempering and annealing are precisely the devices to use for the same operations when he is dealing with articles that have already been impregnated with carbon on their outside surfaces.

An article that has been impregnated with carbon for the purpose of case-hardening may be considered as consisting especially of three parts:

(1) The core.

(2) The external shell.

(3) A transition region between (1) and (2). The core will be the same steel that constituted the article in the first place. That is, the core will have the same percentage of carbon. But, it will no longer be in the original condition. The exposure to very high temperatures which has already taken place has greatly altered the condition of affairs.

The external shell of the article—that is, part No. 2—will now consist of a metal containing a high percentage of carbon. In fact, it will be a thin layer of tool-steel.

The transition part No. 3 will be a kind of average between Nos. 1 and 2.

If now we take the article—consisting of these three parts—and harden it without paying any attention to the changed character of the case, we cannot expect to get the best results with that core. Instead of being quite tough, we may find it comparatively brittle. Usually, that will be just about what we don't want. We will ordinarily want the core tough to prevent breakage from shock.

Let me quote here a very high authority (Giolitti): "It is clear, that proper heat treatment of an article impregnated on the outside can never comprise less than two quenching operations, carried out at two different temperatures, so chosen as to confer the best mechanical properties upon Nos. 1 and 2." What we have to do, then, is so to choose the two temperatures as to get the best results possible with the core and the shell, taking into account the fact that one quenching has to follow the other.

In general, the proper thing to do is to choose the temperature for the first quenching with the view of restoring the core to its proper condition, or as near to its proper condition as possible. The core, as already explained, has suffered because of the high temperature necessary for the impregnating operation.

The next thing, in general, will be to choose the temperature for the second heating so that we can get the hardness desired. We may have to compromise, and take a hardness somewhat less than that desired, because of a necessity of avoiding too great brittleness.

There is one set of conditions where the heating and quenching for the purpose of restoring the quality of the core may be omitted. This is when the piece is not to be subjected to bending nor to shock. It is not so seldom that these conditions exist. When it is expected that only one quenching is to be performed—namely, the quenching for hardening—then we are to manage the impregnation with carbon in such manner as not to use the high heats. This is important. Let the reader be alert. When we are going to use only one quenching, we must be alive to this prospect when we are injecting the carbon to produce the high-carbon shell. The temperature to use may be between 1562°-1742° F. (*light red to light orange*). It is not to be higher than 1742° (= *light orange*). The object in view in using a moderate heat is not to get the core into such a bad condition that the quality would have to be restored by a special heating and quenching.

The cups and rings of ball bearings are instances of the kind of work where it may be desirable to *omit* the restoration heating and quenching. The reason centers on the difficulty of keeping such parts to their exact proper shape when heating and quenching for the restoration of the quality of the core. The heat would have to be high, if the steel out of which the rings and cups were made was quite soft originally. Such steels require pretty high heats in order to restore the quality.

On the other hand, an American authority recommends for low carbon steels that have been impregnated at 1600° F. (between *light red* and *orange*) the following heat treatment. He considers that, for these low carbon steels, the impregnation at 1600° F. is sufficient to cover the matter of the refinement of the grain. So the restoration heating and quenching may be omitted, under the conditions specified. The one heating and quenching, he regards as sufficient. This heating and quenching is the one designed to do the hardening. He prescribes a temperature of about 1400° F. This is a *full cherry red*. He says that this quenching will not affect the condition of the grain size in the core. "Nor will it increase the brittleness—in fact, it has the opposite effect of increasing the toughness in the very low carbon steels." "Thus, by this single quenching, we have completed the requirements originally demanded." Perhaps I ought to state here that in the present paragraph and in the following one, this American authority is considering impregnations where the shell contains not much more carbon than 0.90 per cent.

There is another case which demands our attention. This is the case where the impregnation has been carried out at 1800° F. (= *yellow*). This is a temperature considerably higher than what we had before. The same American authority prescribes two heating-and-quench-

(Concluded on page 35)

Storage Battery Repairing

**There Are Good Profits In Lead Welding
for the Garage that is Properly Equipped**

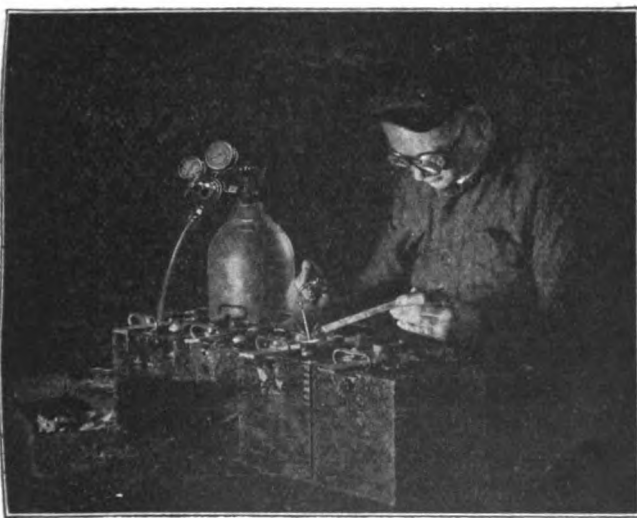
BECAUSE the feature of service is played up so much by shops and stores of every description, a certain number of proprietors are inclined to make little of it, and to feel that on the part of many the claims are mere bluff. Notwithstanding this fact, there is ample proof that the garage that really gives service, and the right kind of service, is the garage that has the best chance to grow, both in volume of business done and in profits earned. A service that attracts customers and at the same time is itself productive of profit is an advantage to any garage or repair shop.

Any garage or repair shop that conducts, or tries to conduct a battery service, should be interested in the subject of lead welding. Every welding shop ought to be properly equipped for such work also, in addition to all the other varieties of welding work that may be done.

Recent estimates indicate that there are now considerably more than ten million automobiles in this country. The repair of batteries for these cars is a profitable line of work. No doubt many of our readers will be surprised when they learn the comparatively low cost of a complete outfit for lead welding.

GASES USED

There are a number of gases used for successfully doing the work: Acetylene mixed with oxygen; hydrogen mixed with oxygen, or city or natural gas mixed with oxygen. Acetylene, hydrogen and oxygen may be obtained from local service stations at a low cost.

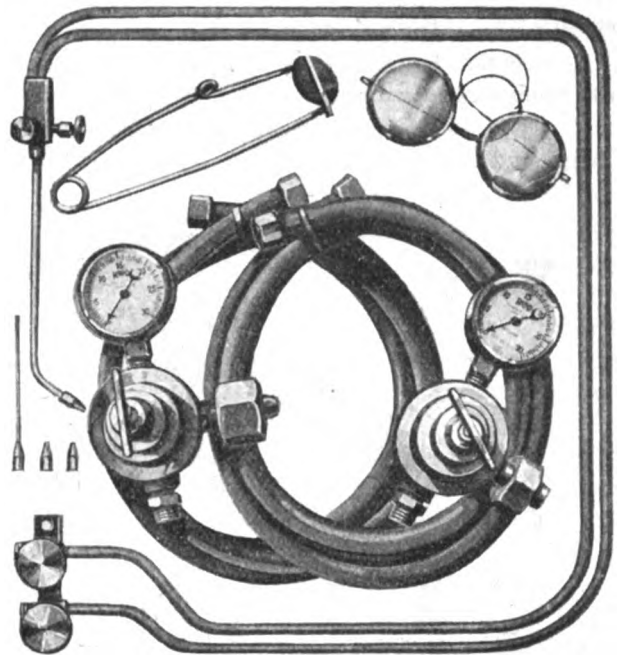


The Welder At Work

Two illustrations, on this and next page, show complete outfits for lead welding, which may be secured at prices ranging from thirty dollars up, according to the kind of gas to be used. These outfits can be used for a variety of work other than lead welding, such as weld-

ing and brazing thin sheet metal; steel, aluminum, gold and copper; also the fusing of wire. Radiator work can also be done with the same equipment.

A most essential point to be kept in mind in connection



Rego Outfit No. 8 for Oxy-Acetylene and Oxy-Hydrogen

with lead welding, is to always have the metal to be welded perfectly clean. Remove all dirt by careful brushing with a stiff wire brush. Dirt on the surface being welded is likely to cause an insulated point, which will interfere with the proper functioning of a battery.

Beginners should first practice obtaining the correct flame adjustment. In place of the usual neutral flame ordinarily used in welding, a carbonizing flame with a slight excess of fuel gas should be used (acetylene, hydrogen or city gas). Next comes skill in building up lead, another thing that should be practiced by the beginner. The melting point of lead is about six hundred and fifty degrees and it will require considerable practice, for some, to attain the desired skill in bringing the metal to a complete fusion and at the same time preventing its running away. Once this operation is mastered the work becomes comparatively easy.

WELDING ON NEW TERMINALS

When replacing terminals the first thing to be done is to cut away and point the old post. The new terminal is then placed over the post; care being taken to set the terminal high enough from the cell top for wrench clearance. The flame is then applied to the terminal at the post top, melting this down to a round puddle. The terminal walls are melted before the puddle

gets wide enough to reach the inside walls of the terminal and widening post puddle is melted or welded into the wall. The first weld in the post is then allowed to cool.

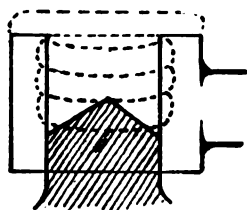
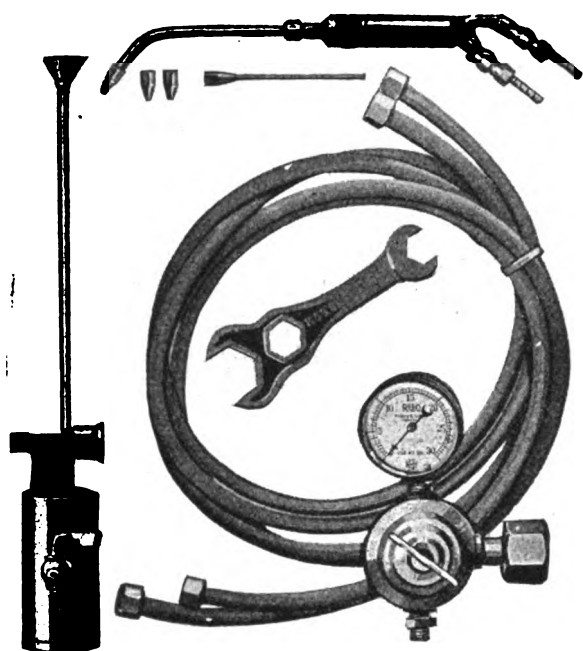


Fig. 1

This is done to enable the welder to note how big the cavity is and to determine whether he has caught the walls of the terminal. After cooling, the surface of the metal should be cleaned carefully and thoroughly. More metal is then added as shown in Fig. 1, by laying the torch first on the puddle and then on a lead stick held in the hand.

It is essential that both stick and puddle be kept at the same temperature in order to obtain complete fusion. The cavity is filled by thus adding several layers of lead. Enough lead is then added to round off the top and give



Rego Outfit No. 10 for Oxygen and City or Natural Gas

the terminal a finished appearance. The work can be tested by giving the terminal a sharp wrench with a pair of pliers and if the strap and element move with the impact it is an indication that the post and terminal are properly welded together. Cell interconnectors are welded the same way, except that it is unnecessary to keep the connectors as high above the cell or cover as in the case of the terminal posts.

Sounds Reasonable

A medical journal says, "to give the face a good healthy color, buy a box of rouge and a rabbit's foot. Bury them both three miles from where you live; then walk out there and back once a day to see that they are still there."—*Driver Dan*.

First Fall Meeting of Auto Accessory Men

THE first meeting of the season of the Automobile Accessories Business Association was held at Hotel Lorraine, Philadelphia, on the 20th of October. This meeting was unusually well attended there being about 400 members and guests present to hear two excellent speakers from the Middle West. These speakers, both members of the Automotive Equipment Association and active in its merchandising campaign, helped to put across the "Ask 'Em to Buy" campaign in Philadelphia. The speakers were R. A. Stranaham of the Champion Spark Plug Co. of Toledo, Ohio, and W. C. Hooker of the Curtis Pneumatic Machine Co. of St. Louis, Mo. The latter speaker outlined plans to show how to make more money in the shop.

The nominating committee presented the names of those to be voted upon at the election in December. In addition to 15 names for the Board of Directors, Guy Lane was nominated for president, George S. Fischer, vice president, N. A. Petry, secretary and R. A. Herp, treasurer. Eight automotive jobbers of Philadelphia combined to help make the evening a more successful one by inviting accessory dealers as their guests for dinner, for the meeting and to see the two merchandising films which followed.

The association has also cooperated with the Director of Public Safety of the city of Philadelphia to reduce the number of automobile accidents. A sticker to be placed on the inside of the wind shield of all automobiles has been distributed during the past week by the Boy Scouts. This sticker is in the form of a red arrow pointing to the right as the driver looks at it, with block print as follows: CAR TO RIGHT HAS RIGHT OF WAY.

1922 Has Broken All Records for Road Construction

TEN thousand miles of completed Federal-aid highways were added to the mileage of the Nations good roads during the last fiscal year, according to a compilation just completed by the Bureau of Public Roads, United States Department of Agriculture. The Bureau finds that the present calendar year has broken all records for road construction. Based on all available data, which are not complete, however, the Bureau estimates the total sum to be spent in the United States this year on highway construction at \$742,000,000. The figures include Federal-aid roads and projects built in addition by the states and smaller municipal units without the aid of federal funds.

The total mileage of Federal-aid highways completed during the past year was highest in Texas with 933 miles.

Water Vapor Attachment

BY C. A. STERN

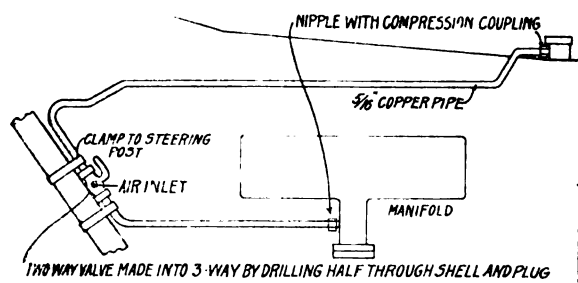
I have used some type of water injection on each of three cars, a Buick and two Chandlers. In the first one, I had the regular Hart-Bell rig installed by the makers, connected up to the water side of the radiator. This was undeniably successful in keeping plugs clean, and reducing carbon formation, but it was a nuisance in one way, in that it would pump the radiator to a dangerously low level after a very short run. The same effect, I found, could be obtained by pouring water into the air intake of the carburetor. So long as water had to be carried anyway to make up the loss, it seemed just as well to do it that way, choosing a time when the motor was good and hot, and giving a treatment about every 500 miles.

Then I got to thinking about how very much better any car runs on a foggy night, and the idea came to me to connect the Hart-Bell radiator connection into the air space above the water level instead of below it.

This combination I believe to be ideal. You do not empty your radiator, but you do get a constant flow of moist, steamy vapor into the intake manifold. The only objection I had to make to the rig I describe was that the piping was a bit small for vapor, though all right for water as originally designed. However, I used the same piping and valves on the Buick and on the first Chandler, and consider myself more than repaid by the resultant freedom from spark plug fouling and the small amount of carbon deposit.

So far there were no very definite figures to support the claim that water vapor really helped, although observation left no doubt in my mind.

Early this year, starting in with a new Chandler, I ran a comparative test which I believe will be of interest. For the first 4,000 miles I drove the car just as it was delivered, that is, with no special fittings. I used Motorkleen carbon remover every 700 miles. It was necessary to have the carbon burned out of the motor at 1213 miles, and again at 3562 miles.



Then I put in a water vapor line, using 5/16" copper pipe and a 3-way connection, one way being all shut: one being vapor to manifold, and the third being atmosphere to manifold.

To date the car has been driven 3,000 miles since the last carbon burning, and is still running as sweet and clear as the day after it was burned. This is to be compared with the first interval of 1,213 miles and the second

interval of 2,349 miles. I still use Motorkleen every 700 miles. In other words, the vapor line has kept carbon formation absolutely from being an annoyance, other conditions being the same as before it was installed.

I find that at any speed above 15 miles an hour the connection to the radiator can be kept wide open. At less speeds it causes erratic running, as would be expected from so large an opening. The third-way connection to the atmosphere is very convenient in touring in hilly country, as if opened wide while coasting a long hill it pulls the radiator temperature down 15 or 20 degrees in a very short time. This is usually more than enough to prevent boiling on the next long grade, even in summer weather.

The sketch shows the installation, which anyone who is handy with tools can make in an hour.

Protecting the Used Car Buyer

SOMETIMES it happens that the buyer of a second-hand automobile secures a car which later is proved to have been stolen, in either his own state or perhaps a neighboring state. Difficulties develop and it becomes necessary in many instances for the new owner to prove that he had no knowledge of the theft. Proper laws to safeguard the purchaser of used cars are much to be desired. The New Jersey motor laws include one which requires proof of ownership as far back as July first, 1919, when a law was enacted that requires every person selling a used car to furnish a prescribed form of Bill of Sale, duly acknowledged before a Master in Chancery or one authorized to take acknowledgments in that state. Subsequent assignments must be attached to the original instrument. Before this Bill of Sale can be issued, proof of ownership must be furnished as above mentioned. If an owner loses his original bill of sale, he can comply with the law by securing a duplicate copy from the dealer or agent making the original sale. "This regulation," says Commissioner of Motor Vehicles, Wm. L. Dill, "not only protects each purchaser but likewise precludes the possibility of cars with faulty title being registered in this state, thereby placing the stamp of approval upon a fraudulent transaction." Garage owners and dealers in used cars should endorse any movement designed to enact similar legislation in their own state. Most all cars stolen are quickly sold, and the sooner we make it impossible for thieves to so easily dispose of them the sooner will we witness a reduction in the number of thefts.

All Their Fault

"Bill's going to sue the company for damages," "Why, what did they do to him?" "They blew the quittin' whistle when 'e was carryin' a 'eavy piece of iron, and dropped it on his foot."—*Driver Dan.*

Automobile Dealer and Repairer

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M. T. RICHARDSON
President and Treasurer

F. R. WHITTEN
Secretary

M. T. RICHARDSON, Editor
GEORGE H. WILSON, Managing Editor

F. R. WHITTEN, Advertising Manager
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Keeping Busy in Winter

There are just as many reasons for a shop being busy during the winter months as there are for its being busy at any other time of year. The reason why so many garages and repair shops experience a dull period in the winter time is primarily due to the fact that the proprietor or manager is not as wide awake as he should be. Now that winter driving has become so general in many localities, it is important that garage men be more active than ever before. Most owners who do put away their cars for the season, usually select this as the time for a general overhauling, also those who intend to use their cars right along want to be sure that everything is in first class condition, before the real cold actually settles down for keeps. If a determined effort is made to get in all the repair work possible in your locality, it will be an easy task to keep your shop a busy one, throughout the time when a great many fellows are sitting round the stove or heater, wondering, perhaps, why it is their business doesn't grow. Aside from obtaining all the repair and overhaul work possible, you may take in a good many dollars that would otherwise be lost to you, by making a special point of looking over the cars of your customers that will remain in regular service. There are numerous troubles that the car owner don't want to be faced with, away from home, on a cold or stormy day in winter. Advertise the fact that you are prepared to inspect cars

and do anything necessary after the hard summer's service, to put the car into proper condition for winter use. There's no need to go into details. The up-to-the-minute garage and repair shop man will realize the possibilities for profits. It's up to him to start right now.

Have You Tried?

There is a saying to the effect that a man couldn't stand on a busy street corner in New York, or any other large city, and give away gold dollars to the passers-by. Perhaps this is a true statement, in fact most likely is the truth. However, while there's cause to question the possibility of being able to give away gold dollars for nothing, on the contrary, there's no reason why our readers cannot secure ten real dollars almost as easily. Our Prize Contest Announcement, which appears on the second page of this issue, will explain how you can become one of these lucky ones who are going to receive one or more of the prizes. This issue contains some of the recent letters entered in the contest. We are sure any of our readers can do as well. Now is the time for you to send in yours, if you haven't already done so. The contest closes December fifteenth and letters bearing that date on the postmark will be the last entered for the prizes.

The New York Show

Many factors are responsible for the increasing interest in the forthcoming Automobile Shows. It is expected that the New York show will experience a record attendance. Recent closed car shows in this city and Chicago bear out the prediction that the closed types will prove a strong rival of the open cars in volume of production, in the near future. It has been estimated that the total production of closed cars for 1922 will be at least twenty-five per cent and possibly thirty per cent. It is a fact that buyers have never before been able to secure so much comfort and reliability in standard motor vehicles designed for all year use as are available today. This is, of course, due to the increased volume of production of this type of body. Manufacturers are preparing to meet what has become pretty nearly a universal demand for closed body types at present day prices. There is no doubt that the public will exhibit particular interest in displays featuring the permanent type of closed car body and in those which demonstrate the many types of semi-permanent tops, of which there are a number of most excellent design on the market.

During the time of New York Automobile Show, a group of wholesalers and members of the Automotive Equipment Association will hold a dealers' meeting, open to garage and repairmen from out of town. There will be a showing of two films, accompanied by merchandising talks by Ray Sherman. The two films are entitled "Ask 'Em To Buy" and "Shop Profits." If you come to New York for the big show, don't forget to take in this important and interesting side-show.

The Critical Point in Business Recovery

Business is better, and there is a growing undertone of confidence which approaches optimism. There have been considerable increases in the rates of production in most lines of manufacture. Today some industries are handicapped by the shortage of cars, and others, notably the automobile manufacturers and makers of tires and automobile accessories, are experiencing the usual seasonal slackening of demand. Considering the country as a whole, retail and wholesale trade probably are better than a year ago, but of course conditions vary a good deal in the different localities.

Thus far, business expansion has been on sound lines. Manufacturers and merchants have placed orders cautiously and only after the most careful consideration of probable future demands. The critical stage of the recovery from the depression of 1920-21 has now been reached, however, and some tendencies of a disturbing character are beginning to appear, among which are the rapid upward movement of prices and of wages. During the ten years from 1903 to 1913, comparative peace prevailed throughout the world, and while temporary depressions were experienced, it is probable that the general level of comfort was higher than at any preceding period. During those ten years the rise in the general price level of the United States as measured by the wholesale price index of the United States Bureau of Labor Statistics was 18 per cent. Despite the general prosperity, and the fact that price increases were fairly uniform for the main groups of commodities, this rise in prices was regarded as so disturbing as to give rise to numerous investigations of the high cost of living and its resultant unrest.

The same wholesale price index shows an increase of 12 per cent in the eight months from January 1922 to August 1922. Wages are also rising. As individual employers and groups of industries bid against each other, wage increases are certain to be felt in stimulated retail and wholesale trade. There is danger that as a result of this and some other factors, the prices of consumers' goods will rise so rapidly as to present a mirage of approaching prosperity.

The hysterical pseudo-prosperity of 1919-1920 ran a long course because it was part of a world-wide movement. It is useless to harbor illusions about any similar movement which might develop now as a result of the present psychology of rising prices and wages. World-wide conditions are not favorable to any such development. The present upward movement of prices and wages in the United States is not and cannot be uniform, for the fundamental reason that prices of all those commodities and classes of goods, the surplus of which must be sold on the international markets, are determined by conditions in these markets. It is obvious that the farmer's purchases of implements, fertilizer, automobiles, dry goods and all classes of commodities are necessarily limited when the wages of a city laborer for one six-

day week at \$5 per day are equivalent to the gross selling price of two good hogs or twenty-five bushels of wheat.

It is now to be demonstrated as to whether the combined judgment of the business community of the United States is wise enough and farseeing enough to prevent developments which could only too easily nullify all the progress thus far made toward real prosperity.

CASE HARDENING OF STEEL

(Concluded from page 30)

ings. That is, we heat the article up to a proper heat (depending upon the carbon content of the original steel) and then quench it. This is the first of the two. It accomplishes the restoration of quality of the core—at least, that is the aim. The second heating and quenching is carried out at about 1400° F. (= *full cherry red*), as before. The reader is to remember that here we are to assume that the impregnation was not carried much beyond whatever was required to produce a shell containing 0.90 per cent of carbon.

This limitation to shells containing only about 0.90 per cent carbon means that the case-hardening is designed to produce only a good tool steel surface, and not a super-hard surface like a razor. If fact, Bullens states, in effect, that the present tendency in the practice of case-hardening in industrial plants is to limit the outside shell to the moderate tool steel which contains 0.90 per cent of carbon. The object seems to be to prevent the formation of the tool steels which have a honey-comb of cementite.

Let me recapitulate the rules given by the American authority. First, only cases are to be considered in which the shell is a moderate tool steel—that is, one containing not over 0.90 per cent of carbon. Note that this refers to the shell and to the shell alone. Then we are also to assume that the article is made from a soft steel.

Rule 1—for cases where the impregnating is done at 1600° F. (between *light red* and orange). One treatment is to follow the impregnation. The article is to be cooled down, say, to *black* and then heated to 1400° F. (*full cherry red*) and then quenched.

Rule 2—for cases where the impregnating is done at 1800° F. (yellow). Two treatments are to follow the impregnating. First, the article is to be cooled to *black* and then heated to the proper annealing temperature and quenched. Second, after again being cooled to *black*, it is heated to 1400° F. (*full cherry red*) and then quenched.

How He Likes It

"I would rather go without coal than to go without your Automobile Dealer & Repairer, as I think it is the best automobile magazine published.

Yours truly,

C. M. SMITH."

REPAIRMAN WHO WON FORTUNE FROM WRECKS

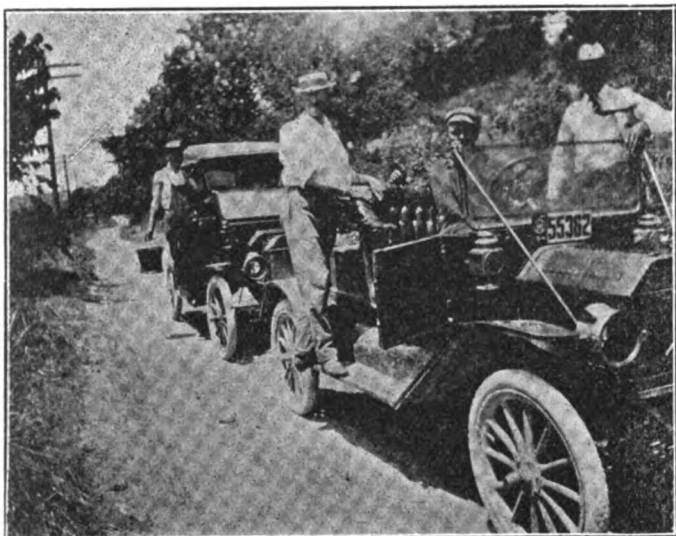
(Continued from page 10)

Shaw turned the album to pictures illustrating wrecks which came of the cause in question. Then he retrieved a little and went on:

"Of course not all off-the-road wrecks come from this cause. There may be any number of wholly other elements involved."

"In an off-the-road wreck, what is the most difficult type of motor vehicle to handle?" we queried.

"A truck! We regard a truck, upset, off the road say fifty feet on a very bad night, about the worst sort of task we may be called upon to handle."



When Friends Can't Help

We asked the methods pursued in such a case, and it was explained very much in the following way:

Reaching the site of the accident, the wrecker-car draws up at one side of the road and the expert aboard views the site. Satisfied as to the location of the most convenient "guy-points," he brings a line from the car; fastens this to some tree or post, or other object convenient here; and then proceeds to 'carry' the line back to the car.

Connection is then made with what is popularly known among the wreckers as the "winding-machine"; winding up of the line is begun as a test; the far end of the cable is then made fast to the injured auto, and next moment, the raising begins.

Mr. Shaw has made a careful test of cables and attendant equipment for this work. He finds that a three-eight flexible steel cable—six strands of nineteen wires each, the rule, with a tensile strength of 9800 pounds, is best fitted to his ends. With such a cable attached to a high-powered lifting device, a single attendant, aboard the wrecker can bring a six-ton automobile from just wherever it may be; provided that the auto shall rest anywhere within 3700 feet of the edge of the road.

In other words, there isn't a car that can't be brought into the road again through no more herculean effort on the part of the wrecker-in-charge than manipulating the

hand-crank of the machine and of course, looking to a proper distribution of the lifting cables.

While getting to the given wreck may often be a matter which calls for the very highest possible speed on the part of the wreckers, as a general rule the bringing of the remains of the car into the highway, and then carrying these to the repair shop do not call for such extra-great-races with time. The damage has been done, the injured have been dispatched to their homes or hospitals; and are under the care of their physicians, a few moments more or less cannot count in the ultimate fate of the car.

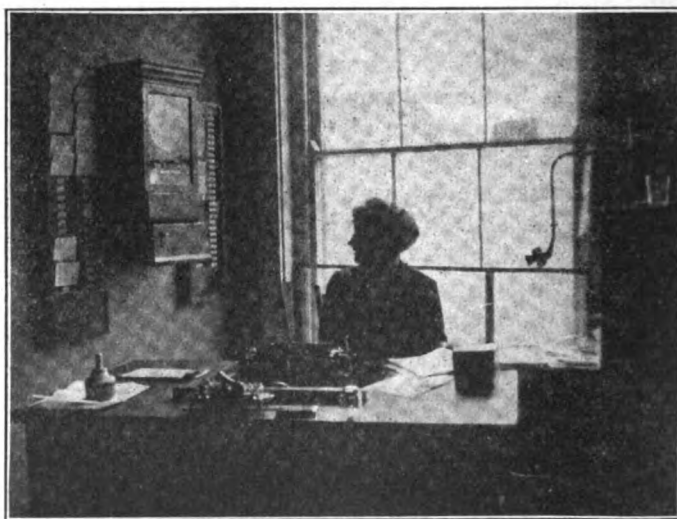
At that, though, Shaw insists that his men keep to such speed as they can on the way.

As proof of this, he produces the testimony from the owner of a truck of familiar pattern, whose vehicle "took a spill," as Shaw would say, of 97 feet from the road-edge and this at a place three miles from his garage.

"The call came, the wreckers departed, they found the car, raised it and had it here in the shop inside of 55 minutes of the time they had gone."

Shaw permits no repairs to be made at the site of the accident unless absolutely necessary to lifting the car to the wrecker itself. "Positively no roadside repairing" otherwise is his rule.

So, too, Shaw will not tolerate any towing of injured autos. Every car, no matter how slight the hurt received by it, must be "craned" aboard the wrecker-car. Where all four wheels are off, or other circumstances make it impracticable to proceed otherwise, the "ruin," as he calls it, is swung aboard a truck reserved for cases of that sort and brought to his shop in this way. Otherwise the remains of the car will be swung onto the more



The Office at Shaw's

usual repair-auto and carried to the garage in that, the most convenient, way!

For this initial work with a "wreck"—for the proceeding to the scene of the wreck; bringing the car onto the automobile which will bear it to the repair-shop; and then for this bringing it in Mr. Shaw makes a charge of eight dollars for the first hour of service and six dollars for every succeeding hour or fraction thereof. Time

begins to "count" from the moment the wrecker-crew leaves the shop and continues to "count" until they cross its threshold on the return.

"Just what happens when you have brought the auto to the garage here and the owner is in a position to get into touch with you on the matter of repairs?" we inquired next.

Shaw, we had been told, had taken a tremendous lot of business from really successful competitors because of some of the methods he employs and of which delighted clients proceed to relate to other motorists, far and near.

"Before we will accept any order whatsoever for work upon that car," he answered, "we have our 'diagnostician' go over the entire wreck and make a complete survey of what it will require to get it back into shape.

"Based upon this, we prepare for the client an estimate of costs, item by item, and this is submitted in writing. As far as we can learn, we are the only concern in the locality developing this 'estimate-work' to as fine a point as I insist on here.

"At his convenience we then meet the client—agree what things suggested shall be done and agree upon the price. This agreement is then made the subject of rapid checkings on a form signed by both parties to the contract, so that there can be no dispute later as to just what was wanted, and exactly what had been agreed."

The Shaw form-sheets omit nothing in their listings of things to be done for, or placed upon, the injured auto. Whether one is to have the frame straightened; whether axles are to be "checked" here; whether fenders are to be repaired or replaced; whether the body is to be overhauled, or there is to be a systematic and thorough "general-check-up" of the automobile, whether a spring is to be guarded against breaking; this is stated and the statement is accompanied by one of the cost involved! The parts that will be needed, even to the smallest, then an estimate of the time it will take to put those parts in place, to make the repairs desired—all these things and many more are listed here.

Sometimes it will happen, as with cross-country tourists coming to grief near Cincinnati and impatient to be on, that Shaw is urged to speed on the work of repairs as much as possible.

In such a case, returning to the example of the car wrecked at midnight fifty miles from the garage site, and brought into the garage in record time, Mr. Shaw will have the estimate ready for the client, undoubtedly busied with other matters developing from that wreck in the meantime, by ten of the morning of that particular day. Delivery of the estimate then, means that Shaw knows *exactly* what is to be done to, or with that auto and that his men stand prepared to proceed squarely ahead.

Naturally, how long it will take to make things shipshape once more depends upon the circumstances of the case, the degree of the wreck, and whether all necessary parts are available. Shaw keeps a colossal array of parts on hand; but no one man can afford to store up specimens of all which may be used in ALL types of automobiles in

use now in any Anglo-Saxon land.

Given the very worst sort of wreck, however,—given a big car which has been completely battered and smashed, and Shaw will have it ready for use in six working days' time; provided always that the parts required are to be had. A courtesy-system between himself and many other garage folk in the Greater Cincinnati area permits of his drawing upon the supplies of the others if they happen to have what he has not; but sometimes the part which is needed is not to be found, all about the town, and then there succeeds a delay for which the house of Shaw cannot be blamed.

Where the car so repaired is to be repainted as well, "two weeks for all work" is required.

Shaw's terms with this service are invariably cash and on delivery; and delivery is made just the moment work is finished and the completed car has been tested, or as he puts it, 'given her final try!'

SOUVENIRS

Come when you will to the Shaw repair shop and you will be certain to find souvenirs of motor-wrecks of decided interest.

We asked Mr. Shaw what was really the commonest type of wreck with which he was called upon to deal.

We were not querying as to causes—we believed we had heard his last words on that subject—but we wanted to know of wrecks that ensued.

"The head-on 'skid' into the curb!" was his instant answer.

A wreck of this sort may be made shipshape, the car made as good as new, in two hours; or it may take the Shaw experts as much as five days to repair. Naturally a "five-day job" will represent a pretty bad smash-up; there will be dis-assembling work with the body, and then re-assembling; there will be a motor to re-build; and so on.

But, this good-sized business has been built up not merely by endeavoring to give quick and expert service but scores of patrons have been obtained through a reputation for attending to details not strictly in the line of duty; but for which patrons have many reasons to be deeply grateful later on.

Thus, for one, Shaw happens to know that many motor-wrecks result in suits at law, before a very long time. He knows, too, that, if such suits at court come it doesn't hurt his client at all to be able to prove exactly what he says. If you, in your car, were riding along at a very moderate and reasonable pace and Roosa, in his roadster, came hurtling along from an unsuspected cross-lane at a speed little short of the whirlwind's; and Roosa crashed into your car at a point where you,—and not *he*—had the moment's right-of-way, the damages to be accorded to you by the jury would be very closely proportionate to the exactness with which you might prove this point!

Therefore the Shaw repair-forces have their exact instructions as to just what to do on arriving at the site of a wreck in the interest of the client's attorneys, and probably his insurance.

"First of all, to go back to the story of what happens when our crews reach a wreck-site," Mr. Shaw suggested, as we pressed him for some of the details omitted from the major thread of the narrative, "every effort is made to discover whether anyone is badly hurt and can be assisted in any way. After this, all care is taken to do what may properly be done for the bodies of the dead, if there be such.

"This much of the initial work upon the scene of the disaster is commonplace and obvious, however, and does not need to be more than touched upon.

"What we do next, though, we believe is a bit different from what is done by any of our competitors here.

"The man in charge of the salvaging of the wreck produces a rule and measures exactly—and before some witnesses—just how far the injured car rests from the road. This determined, he make whatever other measurements may be required to determine just who is at fault and to exactly what extent."

Motor-car owners of Cincinnati and the territory contiguous to the city have come to learn much of this service! They have heard from Smith and Jones and Brown and Black how those measurements which Shaw had on hand, "saved the case for them," and they know that—well, careful drivers though they consider themselves, there might come an occasion when just such statistics might stand them well in stead, too. Hardly a day, in fact, but some *attaché* of the Shaw establishment is not called into court to testify for his client or that, and the judges of the three counties of Ohio and of Kentucky meeting here have come to take the Shaw statistics very nearly at face.

Just how complete these statistics may be in a really serious accident may be gleaned from the following typical excerpt of what Mr. Shaw's representative read not long since into the records of the court:

"The car of the defendant, hit the car of the plaintiff fifteen feet and three inches from the intersection of the two streets aforesaid. The rear wheel of the car under discussion was exactly sixty inches from the curb. The front wheel was sixty-two and three-quarter inches off the curb. The car under consideration was headed east on a street running east and west. The plaintiff was on the right side of the street. The other car was coming west and the trail left by a sliding tire on his machine stood at seventy-eight inches from the curb. The collision was of such a sort that the car under discussion was hit squarely at the right front-corner."

The grammar and the construction employed may not be of the very highest calibre; but it isn't difficult to guess which party to the suit will receive the verdict in the face of testimony as exact as this!

Mr. Shaw has an inexhaustible fund of anecdotes of wrecks and the causes for such to relate to whomever will but tarry and hear.

During the night-time hours the period between midnight and two in the morning he claims to be most prolific of motor accidents.

"First, too much 'looking-over' the road houses along

the motor ways; then too much speed, for making up time lost in that manner," he tells us, is the prime cause of this.

In the day-time wrecks, there are several causes, wet weather, resulting in "slick" streets and roads—is probably the largest single reason for these. Reckless driving comes next. Misjudging distances is a close second. Men should be forced to prove themselves good judges of distance before being permitted to drive any car.

Business has been exceedingly good of late at the Shaw garage here and almost daily it continues to grow better.

Mr. Shaw, asked to summarize the basic reasons behind this, does not hesitate for an instant in replying:

"Trying to give the client just a little more than he actually bargains for—and then advertising,—advertising given you by the client;—other advertising, purchased in the more usual way."

On the country roads radiating out of Cincinnati, Shaw holds charters to not less than fifty-three bill-board sites and on these sites he has mounted his bill-boards. He invests very nearly four-hundred dollars in telephone-directory advertising in the locality annually. He spends a little fortune in newspaper, program, auto-club bulletin and similar advertising beside.

In every advertisement published he gives just the firm name, the location, the telephone numbers, the offer of the reward for any car he cannot raise and bring to the repair shop for further treatment; and then all possible emphasis on the fact that he makes a specialty of wrecks.

"I suppose it's like this," Shaw confides, as he leads the caller to the door in parting, while another wrecker car, with its sadly dismantled burden, comes hurtling through the entry-way:

"Folks figure that if a man can repair a wreck he can do just about every other sort of auto repair work. So they try me out on some bad wreck and well—perhaps they like the service, the prices, the treatment we give them.

"Perhaps they like the things we try to do for them upon the side, giving them accurate legal data as to their wreck, photographs of it and the like, free of charge.

"They like this, we find, and they send us other clients.

"More than that," and Shaw extended a hand to two customers of long standing who had driven up to have their cars given certain attention, "they come back *themselves*, too, again and again and again!"

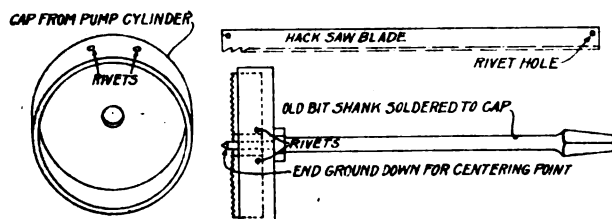
GROWTH

A VERY convincing little booklet, carrying the above title, has appeared on the Editor's desk. If space permitted we would like to reproduce some of its pages for our readers. This little booklet is full of suggestion and urge for the wideawake merchant and business man. It is issued by the Acorn Agency, Inc., New York City. We are minded to recommend our repair shop subscribers sending for a copy. If you don't get some good out of it, 'twill be your own fault.

Cutting Large Circular Holes In Metal

RECENTLY in a small repair shop it was found necessary to cut several circular holes, each of the same diameter, in a sheet of iron three-sixteenths of an inch in thickness. The job was done in the following way.

A cap from a pump cylinder was taken and the inside milled out to the size of the holes to be bored. An old wood bit was taken and the auger cut off, leaving the smooth shank. Three inches of this was turned down, leaving a small spindle which was later used to center the work. The shank was then soldered, after being carefully trued up, in the hole in the end of the cap, with the spindle extending past the rim of the cap about one and a quarter inches.



Two small holes were drilled through the side of the cap and the heads with one-half inch of the shank cut from two nails, driven to a tight fit to anchor the piece of hack saw blade.

The hack saw blade was one-half inch shorter than the inside circumference of the cap and two holes were drilled through this, one in each end, to slip over the protruding rivets. The drawing shows the tool assembled and the way in which it worked.

A small hole was drilled at the center of the hole to be cut and the spindle inserted in this to center the work and prevent the saw blade from leaving the course. A light steady pressure with a hand brace, with plenty of oil, soon cut through the metal.

Such a tool will take work of varying thicknesses, the maximum being determined by the width of the saw blade which is in the clear. Several of these, made from different sized caps, will fill a variety of needs and should be in every small workshop.

Ten Miles From Nowhere

I saw the anguish on his face,

While great and salty tears he shed,

"What sorrow can be yours?" I cried.

"Alas!" he wept, "my engine's dead."

The doctor's wife was entreating her husband.

"George, dear," she pleaded. "I really must have a new fur coat to go with that new gown."

"Well," returned the surgeon. "I can't promise you definitely, but I will look over my list of patients, and if there is one with his appendix left, you get the coat." —*Exchange.*



Wisdomites

There is nothing on which it is more important that you economize than on time. Make all your time count, not necessarily by working incessantly, but by not wasting it.

* * * * *

Soap and emery powder, mixed to a paste, make an excellent preparation for polishing unpainted metal parts of a car. This compound will remove any rust that may have formed and will leave the surface smooth without scratching.

* * * * *

The universal joint on your car should be thoroughly cleaned several times during the year. Then inject a small quantity of steam cylinder oil and rotate the joint for a few minutes. This permits the oil to find its way into the bearing surfaces.

* * * * *

To locate a leak in an inner tube, when there is no water handy, hold the tube close to the dust of the road. Cigar ashes or tire chalk can also be used. Compress the air in the tube and the leak, if at that point, will be located easily.

* * * * *

Don't use a weak battery for the self-starter to crank the engine. Use the hand crank and save the battery as much as possible for ignition.

* * * * *

Reduce the shock to the car when going over bumps by throwing the clutch out. Coasting instead of driving over a bump is much easier on the car as well as the passengers.

* * * * *

New sponges should be carefully inspected before using, to make sure all sand and shell have been removed. This saves scratching the varnish. A sponge should be soaked and softened in soapy water previous to use.

* * * * *

It is said that waste oil, drained out of the crankcase, makes a good spring lubricant after mixing with about fifty percent kerosene.

* * * * *

To prevent skidding try slowly applying the brakes without releasing the clutch, until the momentum of car is reduced.

* * * * *

Clutch grabbing is caused by: too heavy spring pressure; by facings that become rough and dry; by end play in the clutch shaft; by too tight an adjustment. A clutch that grabs puts a needless strain on entire transmission.

* * * * *

Leather upholstery will be improved by an occasional dressing with a mixture of four parts Neatsfoot oil to

one part methylated spirits. Never use gasoline or kerosene to remove grease from upholstery.

* * * * *

A soft rag and plenty of vaseline will remove tar spots from car body. Rub the spots gently until they disappear. Finally wash carefully with castile soap and water.

* * * * *

Proper care at regular intervals is the secret of automobile life and insures owner's satisfaction.

* * * * *

In cold weather use five or six dry cells instead of four, as these cells are less efficient in winter season.

* * * * *

Non-reversing steering gears generally have a reasonable amount of back lash to allow wheels to follow ruts and tracks in the road without side resistance on the tires.

* * * * *

Ordinary mud, if allowed to dry on will dim the lustre of the finest varnish. Wash it off with a gentle flow of water before it dries. Don't rub it.

* * * * *

Broken balls are indicated by a clicking sound. If not promptly looked after the entire bearing will be damaged.

* * * * *

There are more self-unmade men than self-made.

* * * * *

The best wire for electric lighting is stranded copper wire. All lighting wires must be protected from oil, dampness and from contact with the frame or other metal parts.

A Home-Made Tractor

Mr. G. F. Erikson, of Bowdle, South Dakota, is the proud possessor of a traction engine, which is, with exception of the motor and transmission, entirely his own work. The motive power consists of two Model T Ford engines, connected tandem fashion, in

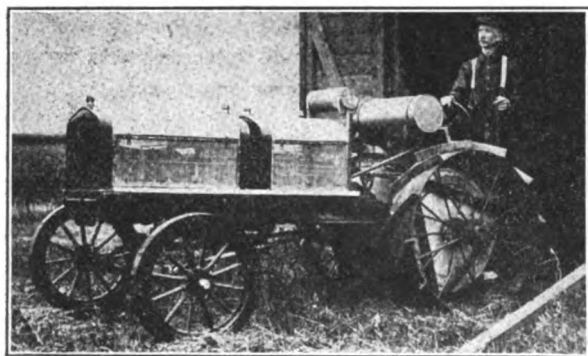


Photo by Keystone View Co.

such a manner that the single crankshaft thus obtained will receive two impulses each revolution. All other parts of the tractor Mr. Erikson made himself, including the wheels, frame and drive pinion and ring gear, in his modest little workshop at the rear of his home. During the daytime Mr. Erikson is engineer at a local railway pumping station.

The Forum

This department is for the readers of our magazine. Here you can express your views and opinions on subjects relating to automobile construction, maintenance and repair, driving etc., and here you can discuss various subjects with other readers.

Letters must be addressed to The Forum, and must be signed with your full name and address, which is not necessarily for publication.

All letters to the Forum will be welcome, but it must be remembered that the Editor assumes no responsibility for the views of readers appearing in these columns.

This month we have some correspondence from an English contemporary, The Garage & Motor Agent, anent the relative value of wood and metal wheels.

WOOD VS. METAL WHEELS

SIR,—The letter from Mr. A. H. Treloggan seems to call for some comment.

Mr. Treloggan rather jumps to conclusions when he assumes that the wide use of the wooden wheel in America is due to its superiority over wheels of other material. The real reason why this form of wheel is so prominently used in the United States is, firstly, the existence of an ample supply of suitable timber, chiefly hickory; and, secondly, to the fact that large organizations have been set up for the manufacture of this class of wheel, which it does not pay manufacturers to abandon so long as they can find a market.

The result of the circumstances is that wooden wheels, which can be produced very cheaply almost anywhere, are in the United States produced at a very low figure indeed. This renders it difficult for a steel wheel of any type to enter into competition with them.

As regards the question of elasticity, Mr. Treloggan is correct; but the need of an elastic wheel merely indicates that the spring suspension of the vehicle would be the better for a little attention. It is the function of the springs and tires to provide the means of absorbing shocks and vibrations, and the wheel should not be expected to take any part in the performance of this function.

As to the power of wooden wheels to resist climatic changes and hard wear, the lessons learned in the late war should be fairly conclusive. It was then found that steel wheels were the *only things* which would stand up to the conditions, and such wooden wheels as found their way into service very quickly disintegrated, and had to be discarded.

There can be no comparison between the wooden and steel wheel, providing that the latter is properly constructed in the matter of strength; while, whatever material the wheels are constructed of, there is one essential feature which is of the utmost importance if a successful result is to be achieved, which is that it should have the least possible number of joints. A *properly designed* disc wheel affords the most satisfactory means of achiev-

ing this result, and, at the same time, of supplying a very important feature, i. e., homogeneity of material.

* * * * *

Finally, we must join issue with Mr. Treloggan as to his statement concerning the effect of disc wheels on the temperature of the tyre. We cannot agree that the wooden wheel is superior in this respect. On the contrary, as the conductivity of timber is very low, while that of steel is high, it is very clear that heat generated in the tyre is more readily transmitted to the wheel, and thence radiated to the atmosphere in the case of a metal construction than with the artillery wheel.

To suggest that the disc wheel retains the heat is to suggest that the ordinary laws regarding the flow of heat from one body to another cease in some mysterious way to operate in the case of a wheel constructed of timber. We think that some sounder argument than that advanced by Mr. Treloggan will have to be forthcoming before the builders and users of motor vehicles can be convinced that the steel disc wheel is not, properly designed, the most all-round satisfactory construction.

pp. R. C. Warren and Co., Ltd.

H. C. CLARK.

London, W. C. 2.

* * * * *

SIR,—In the main I like Mr. Treloggan's letter on this subject. He makes wooden wheels, and he will "talk a donkey's hind leg off" on a public platform in support of wooden wheels.

He says that his spokes stand a *side* pressure of 20, to 35 tons before fracturing. This, I believe. But when he says, "Watch disc wheels on the road, *you will see every bump transmitted to the car* . . . it is rock against rock," ought he not to add that his spokes take *over 35 tons end* pressure before bending—therefore, that when a disc wheel goes over a pot-hole and does not bend, but transmits the shock to the car, we have to believe that his wheels are resilient when the pot-hole pops up, although *rigid* up to 35-ton concussion against breakage!

Methinks he proves too much—the facts being that both makes are, for all practical purposes, *equally rigid*. Neither he nor I have mentioned pneumatic tyres as shock absorbers.

A disc wheel, after standing in the hot sun, will burn your hand, and the *metal conducts* this heat to the tyre (this, I agree, if painted black, but not if white). But Mr. Treloggan's very next words are that the heat generated by the tyre (compressed air) will be "retained by the disc." So now the metal does *not conduct* heat!!!

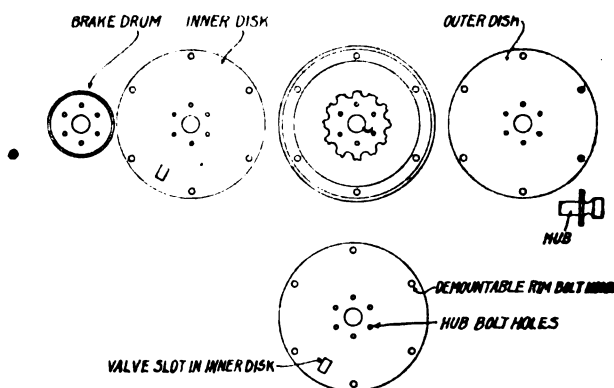
I should not like to meet this gentleman, who is so ready with the weapon with which Sampson slew the Philistines, either on the platform or inside the ropes, therefore I subscribe myself,
Kent.

"AN ABSENT FRIEND."

P. S.—To do my daily good deed, I present Mr. Treloggan with a real talking point for his wooden wheels. He could talk comfortably on discs—the drumming would drown his best arguments.

How to Make Your Own Disc Wheels

THERE is nothing which adds so much to the substantial and "snappy" appearance of the small car as a set of disc wheels. With a small expenditure of time and money the effect may be produced by enclosing the ordinary wooden wheels with sheet-metal disks. One job, the description of which follows, was completed even to varnishing for about \$12.00, and has given continuous service for more than two years without becoming either loose or unsightly.



The accompanying drawing shows the method of construction. The materials required are:

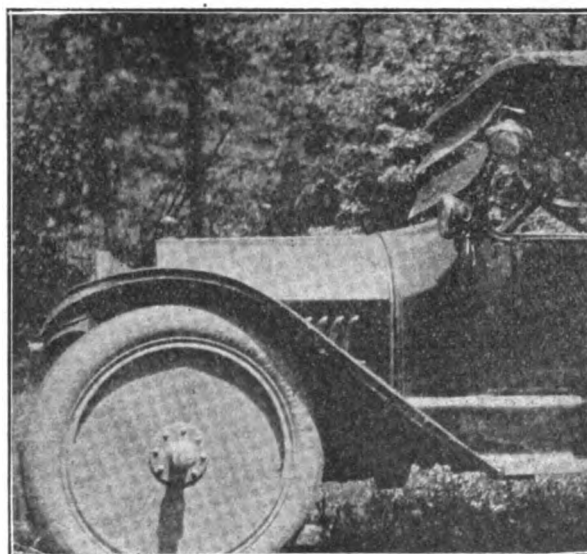
8 disks of 20-gauge sheet-iron or steel.

1 set of hub bolts.

1 yard of cheap felt or heavy canvas.

1 box of $\frac{3}{4}$ x 8 round-head, blue wood screws.

It is best to purchase the disks from a tinsmith and have him cut them to shape. On the outer diameter, they



The Finished Wheel

should be cut to fit against the felloe of the wheel, and as close out to the rim as possible; on the inner diameter, they should fit snugly behind the hub flanges, and barely allow the hub sleeve to pass through. Four of the disks—those on the inner sides of the wheels—should each

have a slot cut, as per sketch, about two by four inches, to allow access to the valve; and, to prevent rust, all the disks should be painted on both sides with a priming coat of lead.

In taking apart the wheels to install the disks, pound solidly sideways on the hub-bolt nuts with a heavy hammer until the bolt breaks, for the threads are usually burred over the nuts, and it is easiest to break the bolts. Remove the hubs, and drive out the demountable-rim bolts. Cut a strip of the felt or canvas about one-half inch wide, and shellac it smoothly around the felloe on both the inner and outer sides of the wheel. This is for the disk to rest against, and is important to prevent rattling.

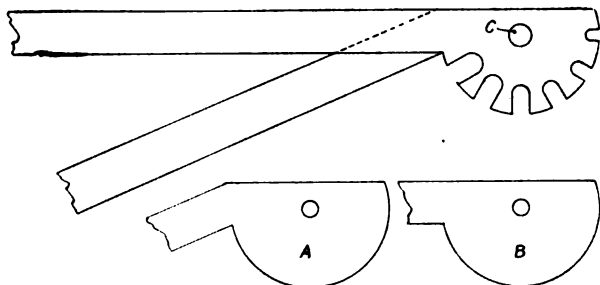
Now, with the wheel flat on the floor, lay one of the inner disks in position, being careful to see that the valve slot lines up with the valve hole in the wheel, and slip the hub through the disk and wheel to center them. Fasten the disk permanently to the felloe with two or three woodscrews, evenly spaced between each two rim-bolt holes. Next turn the wheel over, place a block of hardwood beneath the disk, and drill the rim-bolt holes in the disk, using the wheel as a jig. An ordinary square-shank drill in an auger brace will be found entirely satisfactory, if the hole is first started with a sharp prick punch. The outer disk may now be similarly attached and drilled, and the demountable-rim bolts replaced.

In reassembling the hubs in the wheels, draw the hub-bolt nuts up evenly, and as tightly as possible without stripping the threads, and burr the threads over the nuts to prevent them coming loose. The demountable-rim bolts will aid in keeping the outer edge of the disks tight against the felloe, and the felt strips will prevent rattling.

Wire Shears

A HANDY powerful wire cutter may be made by one handy with tools from two worn out files. The files must be annealed and the file teeth ground out on the two sides that are to bear on each other.

Then the ends are forged to the shapes shown in A and B sketches. These two parts are then placed to-



gether and clamped and a hole drilled for the rivet C. After the hole is drilled they are bolted tightly together and the various size wire cutting slots are drilled and filed out.

The next operation is to properly retemper the two pieces and put in the permanent rivet.



OIL PUMPING IN CHALMERS

3149

From M. L. Dayton—New Hampshire: Will you please tell me what rings you consider best for compression, and to stop oil pumping. I have been told that the three piece piston tight ring will do for both. How should they be installed? I have a Chalmers 1917-6-30-35A. This car has a new block, and oil leaks by on two cylinders quite badly. Please also state proper size for the above make of car.

Reply: There are a number of good piston rings on the market today. We have never tried the one you mention. Some of the best known makes are—Everyday Piston Ring; Burd, high compression ring; Kendell; No-Leak-O; American Hammered Piston Ring, etc., etc. The size ring required for your car is 3-1/4" x 3/16". If you will secure a set of new rings, have them properly and carefully lapped in, we believe, assuming that cylinder walls are true and that the pistons are of correct size, that your trouble will be overcome. It may be necessary, however, to drill holes in piston to carry off the oil that works by the rings. We will be glad to furnish instructions for lapping in rings and drilling holes, if you decide to do this yourself. We recommend that you give the job to a competent repair man, one who stands back of his work.

SPARK INTENSIFIERS

3150

From J. A. Wilemski—Michigan: I drive a Packard single six. I saw some spark intensifiers advertised which go on the spark plugs. Are they worth-while to be attached and do they not possibly hurt the insulation in the coil?

Reply:—The lure of the spark intensifier has induced many a man to add these devices to an already satisfactory engine equipment. Practically, an intensifier will produce a fatter spark, but according to an authority on coils they result in an extra strain on the coil. We do not advise your using this method. If your ignition system is not working as you think it should, have an experienced mechanic look it over. A car like the Packard should be one of the last to fall down in the matter of efficient operation.

3151

From J. C. Gorner—Mass.: When I jack my car up I find that there is a lot of in and out movement to the shaft and I would like to know if you could give me any

information about the adjustment or do you think there is something worn on ends of shafts in differential? My car is a Hupmobile 1920.

Reply: Whether or not there is really a "lot" of play in your driving gears or rear axle assembly depends on just what you call a "lot." As you probably know, there should be a certain amount of play in all, or in and out movement as you call it. Just how much would be detrimental to good service in the Hupmobile it is not possible to state but we would say that not over .005 would cause no trouble. If there is more, it is likely that you will find worn parts at the inner end of axles. Perhaps washers need to be replaced.

3152

From E. J. Conegy—Del.: I have a 1919, seven passenger touring Cole 8, model 870; Johnson carburetor. I can idle this machine very nicely and quietly but on every action of the vacuum tank motor will stop. I can overcome this through the low speed adjustment, then it will load when spark is advanced and has no pep on high. I can also overcome the stopping of motor through the throttle screw adjustment at carburetor, but then the motor races. On every action in traffic it will stop. What is the remedy?

Reply: You will very likely find that a careful examination will disclose an air leak somewhere in your manifold, due perhaps to a joint that is not tight. Assuming that your carburetor is in good condition and float at proper height in float chamber, and that all adjustments are properly made, an excess of air would seem to be your trouble.

3153

From L. R. Brown—Ohio: When cleaning the spark plugs on my engine I noticed that the hot spark has burned a small groove in the wire below the point of the plug, making the gap too wide. This makes it hard to adjust the plug satisfactorily. Will it do any harm to file this wire smooth like the rest or should I put in new plugs?

Reply: You can possibly shorten the gap without filing the wire, though it should do no harm to file it. When you can get good new plugs at such a slight cost it would pay to install a new set.

3154

From J. H. Edwards—Ind.: I have a Buick car which I have driven about 18,000 miles. I have had the car for about five years. During the past year I have had great trouble in starting. After it gets started it runs very well. I have ground the valves, looked for leaks in the intake manifold, but am unable to locate the trouble. It is still hard to start. I will be glad to have your explanation of the trouble.

Reply: As there are so many reasons for a motor not starting easily, it is hard to tell from your brief letter just where the trouble may be located. Defective igni-

tion is one cause; imperfect carburetion is another and faulty construction may be still another. As you do not state that you have discovered anything wrong with the ignition or carburetion and make no mention of ever having had your engine thoroughly overhauled, it seems that there may be perhaps more than one reason for the failure to start readily. Our recommendation is that you have an experienced mechanic give your car a proper overhauling, and replace parts that are worn or defective, as well as make proper adjustments.

BOOKS ON BATTERIES AND ELECTRIC SYSTEMS

3162

From A. F. Spangler, Penna. I do all the battery charging for an industrial concern operating a number of cars, also make battery repairs. I want to learn more on this subject. Can you tell me where to get a good book on storage batteries and auto electric systems?

Reply: Can you secure such books as you need from the American Bureau of Engineering, 1601 South Michigan Ave., Chicago, Ill., and from the Norman W. Henley Publishing Co., 2 West 4th Street, New York City.

BOOKS ON AUTOMOBILE WIRING

3163

From H. F. Krahmer, Oregon: Where can I procure the best manual on Automobile Wiring, to cover the wiring of all makes of automobiles for several years past and the present makes. Also would like to know the cost of such book.

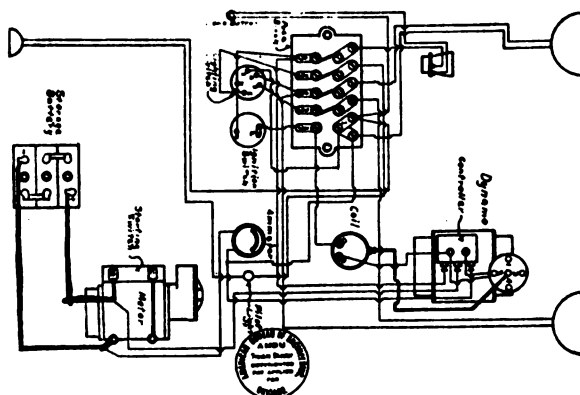
Reply: See reply to number 3162, on this page.

3164

From E. F. Meyer, Virginia: Will you please print a wiring diagram for a Reo 1916, Model R. L. S.

Reply: The diagram is published on this page.

REO 1916 "R"



EXCESSIVE VIBRATION

3156

From W. H. Weiland, Mich.: When I run my car over 25 miles per hour there is a lot of vibration. Otherwise it works all O. K. and I can find nothing

wrong with the motor. Will a crankshaft out of alignment cause this vibration?

Reply: Vibration is due to a variety of causes. Weak explosion in one or more cylinders; a clutch that is out of balance; crankshaft sprung; perfect bearings on one crankshaft throw and poor or worn bearing on another. If your front wheels are out of true they will also cause some vibration.

KEROSENE AS A COOLING MEDIUM

3157

From E. C. Mears, Alabama: I have been told that kerosene used in the radiator instead of water, in cold weather, will prevent freezing. Would you recommend it?

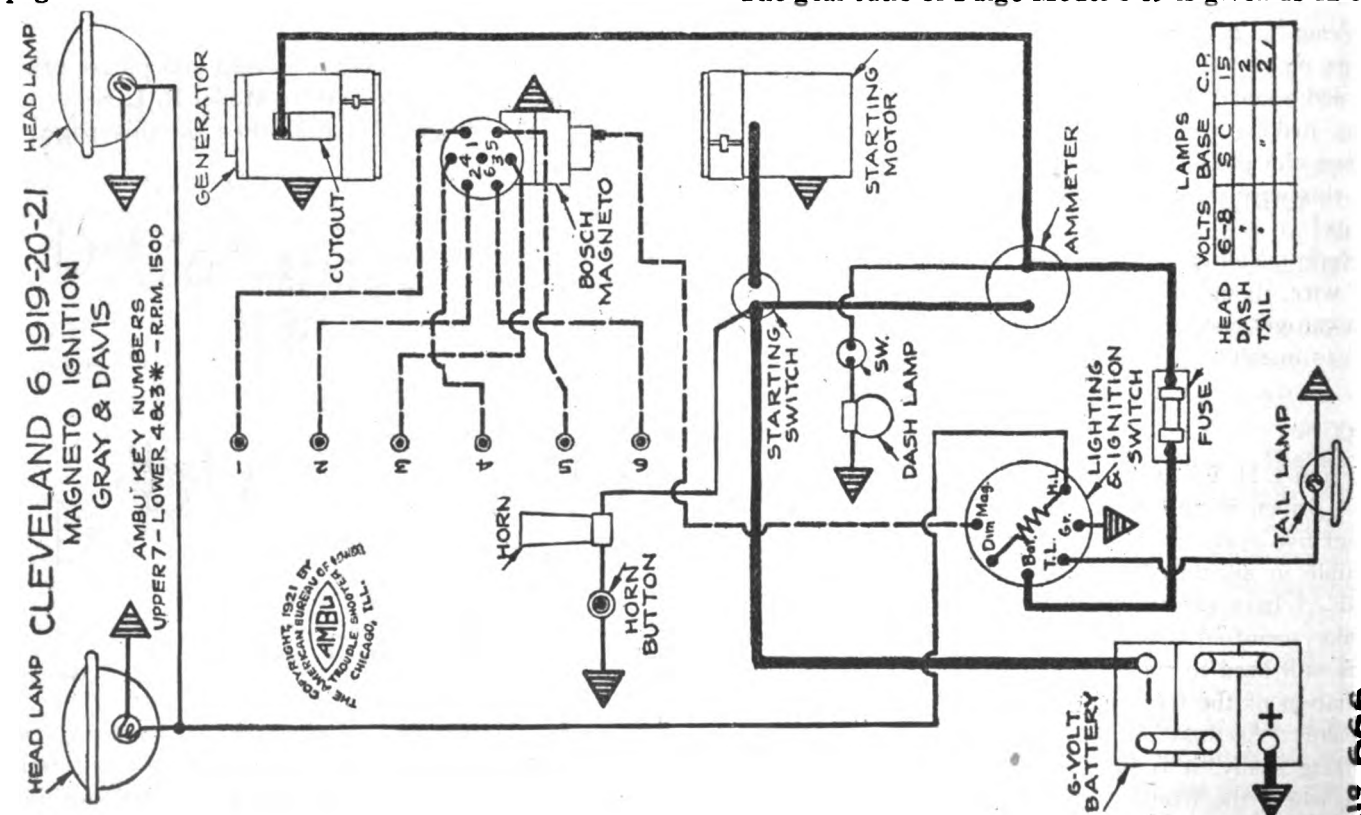
Reply: Kerosene will rot the radiator tubing and also the vapor will spread a greasy finish over the car. It is also liable to form gas and cause bulging or expansion of radiator. Would advise your using water and alcohol, or glycerine mixture.

CLEVELAND WIRING DIAGRAM

3158

From Fred. Huber, New Jersey: Will you please publish a diagram of the electric system used on a "1921 Cleveland."

Reply: The diagram requested is printed on this page.



LOSS OF POWER

3159

From J. L. Rose, No. Dak.: I have a Paige car, Model 6-39, which has a Rutenber Motor. This car has been run 5,000 miles. The carbon has been cleaned off the pistons and the valves ground, and, as far as I can see the motor runs very good, but it does not seem to have much compression. It does not have as much power as I think it should have.

What should be the compression of this motor? I think the compression sisses out the valves. What do you think can be the matter?

Also, what is the gear ratio of this car?

Reply: Loss of power is primarily due to either one or all of four causes: loss of compression; faulty valve action; defective ignition; poor carburetion. The average compression pressure on four and six cylinder engines is between 50 and 60 pounds. The exact requirements for your motor we are unable to state.

The fact that you have run your car only 5000 miles and are now losing power indicates that something is radically wrong. Suggest that you go over electrical system carefully. If you are sure that valves are seating properly and are correctly timed, the trouble will likely be found in the ignition system or in improper carburetion. Your statement that compression sisses out through the valves would indicate, however, that your trouble is chiefly due to faulty timing of valves or a faulty job of grinding. Loss of power, however, is very often due to a combination of causes and you should go over your power plant carefully and not confine the search for trouble to one particular unit.

The gear ratio of Paige Model 6-39 is given as 12-53.

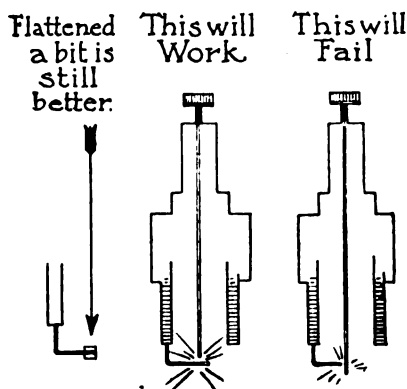
Work Shop Experience Prize Contest

Open to All Readers—Full Details Are Printed On Page Five

[Here are some of the letters received for our Work-shop Experience Prize Contest. If you haven't sent in yours yet, do it today. Your letters will help to make this magazine more interesting to our readers as well as bring you opportunity to share in the rewards offered for the most interesting and practical article submitted.—Editor.]

CURE FOR OIL PUMPING PISTONS

Here is my medicine for a piston that pumps oil: I take out the spark plug, take a pair of pliers and change the gap on the plug. Then by changing the ground wire over the top of the center one the ground acts as a

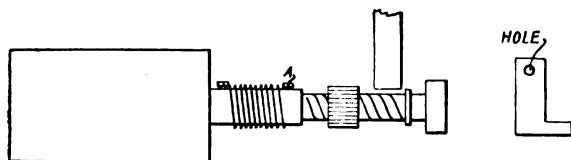


shield or guard and the spark has a better chance to jump and is much hotter. I have cured many cars of this trouble and they have stayed cured. I enclose a drawing to illustrate what I have done.

Eugene Achard—New York.

ELIMINATING TROUBLE WITH FORD STARTER

WHEN the starting button is pressed and the motor does not turn the engine over, I have found that the trouble is most often due to the fact that the gear on motor shaft does not mesh with the teeth on the fly wheel. Here is how I overcome this trouble. The trouble is due either to wear on the



starter shaft or the sliding gear, so that there is too much play and when the gear is thrown back by the flywheel it goes as far as possible and then its threads creep up on those of the shaft enough to bind. Between nut A, shown in illustration and the spring end,

place a piece of iron shaped as shown in drawing. The projection is for the small gear to strike with flange, thus instead of going to the end of shaft and binding, it will strike this projection while loose and it will rebound just enough to leave it loose or idle. I have absolutely no trouble with my starter since installing the device.

A. R. JOYCE, New Hampshire.

REPAIRING A CARBURETOR

I HAVE a Chevrolet FB-50, Zenith carburetor. A year ago the first of June I cleaned the strainer at the bottom of carburetor and put it back in place and started engine to test it. Gasoline leaked at bottom where I screwed in the nut. I tightened the nut a little more, but still the gasoline leaked out. In trying to tighten it a little more I twisted off about an inch of the carburetor casting at bottom.

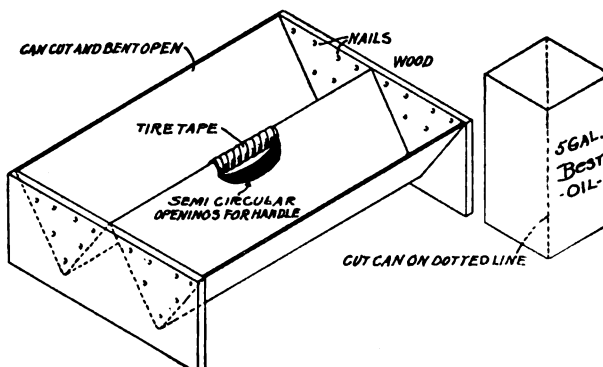
I took the carburetor to the Chevrolet agent, who told me I would have to get a new carburetor, which would cost about \$15. I went home and got a close nipple, which cost me 10 cents. I screwed the nipple into the small piece which broke off, that was all threaded, and then screwed it into place where it broke off.

Since I made the repair I have run the car almost a year and a half without any carburetor trouble.

S. B. ADAMS, Mass.

TOOL KIT MADE FROM FIVE-GALLON CAN

THE tool carrier is one of the handiest parts of any mechanic's equipment, serving as it does to keep his tools collected and with him while working about the car or truck. The sketch shows a tool carrier which can be made up inexpensively from an old oil can, of five gallons capacity.



The can is cut across, diagonally, both ends and down one seam.

Two pieces of board are nailed to the ends after

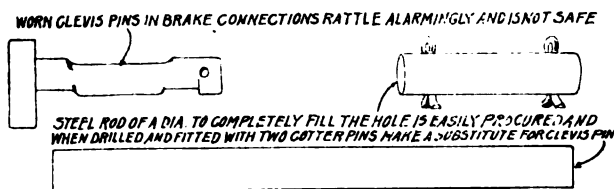
opening the can up. These boards protrude below the edges of the trays and form a rest on which the tool kit sets. At the center two semi-circular slits are made and these are wrapped with tire tape to form a hand hold for carrying.

These trays will accommodate many tools and additionally, where loose parts as pins, nuts, cotters, keys are placed in them, the shape of the bottom of trays is such that these parts are most readily removed with the fingers. In a local shop, practically every mechanic has found this tray to have enough advantages to make up one or more for individual use.

GEO. A. LUERS, Wash.

SUBSTITUTE ROD FOR CLEVIS PINS IN BRAKES

THE usual round head clevis pins such as are used to hold together the many links in the system of brakes and rods about the automobile, are subject to much dirt and consequently wear. When worn these permit of considerable rattle and noise. Renewals are not frequently made because of the trouble necessary to obtain new parts. A substitute method which



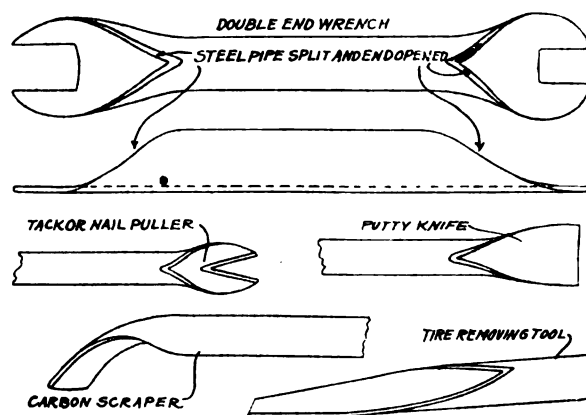
we use, is to obtain a round rod of the required diameter and after cutting off the required length and drilling two holes, fix this in place, inserting a split cotter pin in each end. The cotter pin serves equally as well at both ends as it does on one end of the round head clevis.

The main feature of the substitute is that it eliminates the play and noise, and the rod also can be secured in oversizes, while the usual clevis pins do not always fill up the hole.

GEO. A. LUERS, Wash.

MAKING SPECIAL WRENCHES FROM STEEL PIPE

WHEN special wrenches for odd sizes of bolts, or where wrenches with thin jaws are required for shop use, a method of constructing them which combines a serviceable handle on the wrench, is to use a piece of steel pipe, split open the end, flatten it out and shape the steel to the bolt head. Apart from wrenches for purpose of bolt work, the same idea of using a section of pipe split open can be applied to tack or nail pullers, putty knife, tire removing tool, carbon scraper, or for other purposes where a handle on the tool is an advantage in its use. Hard drawn

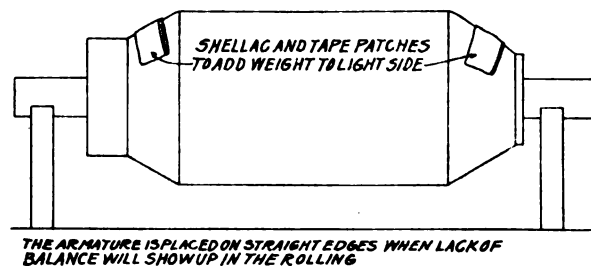


steel pipe is good material for the average purpose and tools are readily made from it with the added advantage of the integral handle.

GEO. A. LUERS, Wash.

BALANCING ARMATURE OF GENERATOR WITH TAPE AND SHELLAC

THE armature of a generator, which was repaired after being burned out, evidenced considerable vibration on reassembly. In a short while the bearings each end of the armature became loose, throwing the part off center and permitting it to strike noisily against the fields.



Upon removal of the armature, the difficulty was not visible until balanced on two straight edges. This revealed the trouble, which was lack of balance brought about by the repair work, which made it heavy on one side. The light side was heavily shellaced and layers of tape were added until the straight edges indicated that the balance had been restored. This work required quite some lumpy additions of the shellaced tape; however, when reinstalled the generator operated smoothly and silently, at high speed, proving the trouble was due entirely to lack of balance.

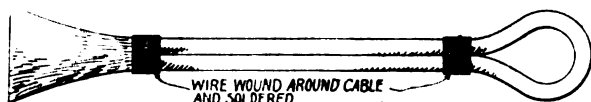
GEO. A. LUERS, Wash.

TWO HANDY KINKS

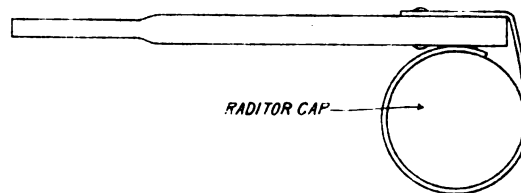
THE sketches show two handy things that cost nothing but your time to make from old material, and will prove serviceable around any shop.

Fig. 1 is a sketch of a handy cleaning brush made from

a short piece of wire hoist cable. The cable is looped and wired together with copper wire; this wire is soldered to hold it. Then the strands of the wire cable are separated into a brush as shown. This stiff wire brush is great for work of removing and loosening carbon.



HANDY CAP WRENCH



If you find that the radiator cap sticks, or the hub cap of your car won't turn, try making a wrench from a piece of wood and short length of leather belt, as shown in the sketch. This simple tool will do the trick.

SALVAGING VALVES

(Concluded from page 22)

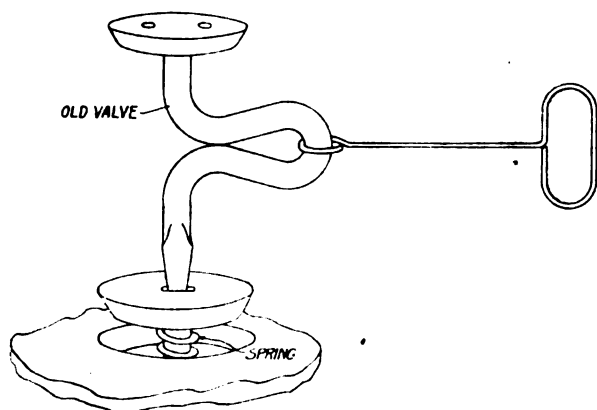
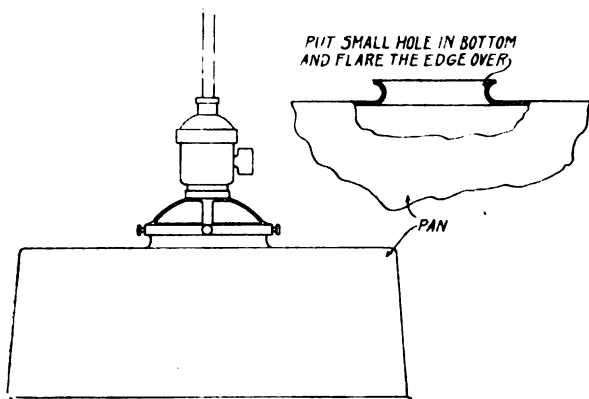


Fig. 2 shows how one may make a very useful valve grinder from a discarded engine valve. The sketch tells the whole story.

IMPROVISED LIGHT SHADE

A VERY good electric light shade for the workshop garage or barn can be made very easily from a small tin sauce pan, as shown in the sketch, simply by cutting a small hole in the center of the tin and flanging



this outward, as shown in the sectional view, then rolling it downward makes it ideal to fit the shade holder. Paint the inside white and the outside green, and the shade is made.

A new catalog of the latest editions of practical books for practical men has just been issued by the Norman W. Henley Publishing Co., 2 West 4th Street, New York. This catalog makes a fine reference book and will be sent free on request to subscribers to the Automobile Dealer & Repairer. Write for your copy today.

Some welders attempt to harden the ends of these stems by adding hard filler but this metal afterwards should be ground off since it is too hard to machine on a lathe. Perhaps the best way is to put on the weld metal and machine it first, then harden it by dipping in molten cyanide. Where the weld does not interfere with the washer slot or the cotter pin holes the operator can build on hard metal by using a piece of an old corn grinder burr or any other chilled iron casting as filler metal. This will impart a glass hard wearing surface. But where there are threads to be cut or slotted holes, the operator must add metal soft enough to be machineable.

Other examples of salvaging valves are the building on of new seatings and the filling of pits and worn places. The former probably is too costly except where the customer is in a great hurry; where time overbalances cost. In this the valve is placed on the flat side of its head and the metal added around the worn part. Each section of this filling is but a continuation of the first melting. The welder either walks around the valve or turns it as he welds.

In filling pits the welder first grinds out the defect or melts it out with the torch. This is essential to eliminate the bad effects of oxide or other foreign matter, which often works harm to the machineable qualities of the weld. In the latter method the welding flame is played over the pit until it melts, then the molten spot is scraped out clean with the filler rod. If the foreign matter is permitted to remain in the weld it will cause poor fusion and therefore a weld filled with pin holes or porous spots. In any event the neutral flame is essential to a homogeneous weld.

The examples given here should furnish the experienced torch operator with food for thought along the line of salvaging valves. From these he should be able to work out other savings and furnish work for the torch in idle times or slack spells.

Some men believe they are entirely self-made because they have forgotten all the help they received.—

* * *

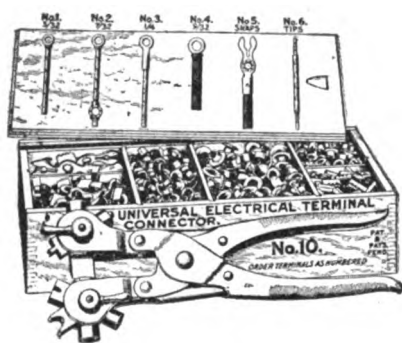
When you meet a person with whom you can't reason let him have the last word at once.

New and Useful Automobile Accessories

UNIVERSAL ELECTRICAL TERMINAL CONNECTOR NO. 10

This terminal connector is so constructed as to make six tools in one. The outfit includes one thousand terminals—assorted, and four hundred tips.

It is said no manufacturer ever built successful merchandise unless he was able first to imagine the satisfaction of the consumer. Consumer satisfaction tells the story of the Success of Universal Electrical Terminal Connector No. 10.



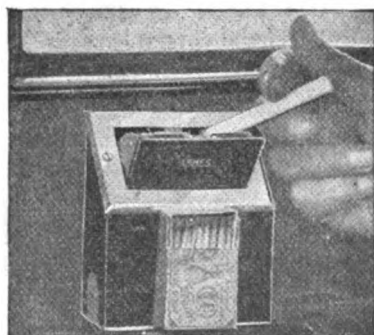
Every type of terminal to be desired in automobile and engine wiring put on without solder. Also Tips Lamp Socket connections. The tool is of the strongest parallel movement construction. Cutter and ferrule gripper included.

An invaluable assembly for any garage or repair shop.

For further particulars our readers should write to Lake-Erb Mfg. Co. 332 W. 58th St. N. Y. City.

FARGO ASH RECEPTACLE

A new appointment for closed cars is manufactured by the Fargo Company Ripon, Wisconsin. It is called the Fargo Ash Receptacle and comes in two models. One for insertion in the dash, the other to



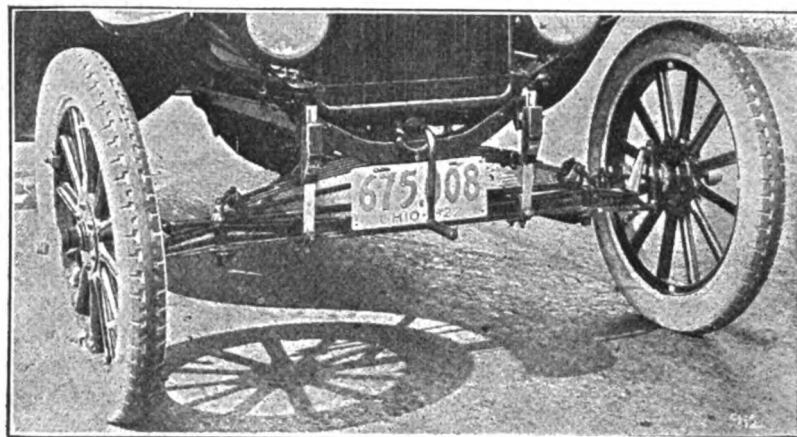
be fastened to the sidewall of the car in a convenient position. A spring door opening at a touch provides a place for ashes, matches and stubs, making it unnecessary to open windows or doors and permitting the smoker to keep the car clean.

The selling price of either model is \$3.00. Finished in black enamel and nickel.

CHECKERS

Checkers are designed to properly control automobile spring action. The principle of checkers is a friction caused by a steel blade traveling between two pieces of specially treated friction material. One of these is mounted in the housing and the other is fastened to a floating wedge. A roller acts between the wedge and the inclined surface of the housing and an adjustable spring presses down on the wedge. The effect of checkers is a constant heavy resistance on the rebound and a much lighter resistance to the upward movements of the axle.

Checkers are the simplest and most effective stock absorbers built. There is only one moving part and the action is instantaneous causing the springs to be under con-



trol at all times. There are no fabric straps or springs to weaken or break. Checkers may be installed on a Ford car in fifteen minutes without removing any parts of the car or drilling any holes in the chassis. They are simply clamped to the car with a wrench. There are two in the front and two in the rear; thus eliminating all side sway and unpleasant rebound experienced when going over rough roads or thank you mams.

Checkers may be adjusted to suit each individual's idea of riding comfort and once adjusted require no further attention either in adjusting or oiling. All moving parts are of steel; thus, insuring long life.

Checkers are distinctive and add to the appearance of the car. They are easily distinguished from any other shock absorber as they have a Red Cap which may be seen for quite some distance from the car.

Checkers are manufactured by The Wellman Wieher Checkers Company, 7000 Euclid Avenue, Cleveland, Ohio to whom all inquiries should be addressed.

INDIA MAKES NEW TRUCK TIRES

Dealers all over the country are reporting favorable comment and increasing demand for the new Double-oversize, Extra-ply, Flat Tread India Cord Truck Tire, manu-

factured by The India Tire & Rubber Company, Akron, Ohio.

The tread of this new tire was especially designed for conformity to road surfaces. The broad, flat face which comes in contact with the road, wears very slowly and evenly, and gives greater traction and non-skid qualities. The heavy ribs on both sides of the tread afford additional protection against rut and curbstone wear.

The tread stock has been brought well down over the sidewalls, giving added strength to the carcass.

The bead has been extra-heavily reinforced.

A special cushion and breaker strip construction is incorporated which distributes road shocks to all parts of the tire, rather than allowing the shocks to be absorbed by just those portions which are struck.

India officials state that sales of this tire are far surpassing production, even though all of the equipment for making these sizes is in constant use.

NEW GILL PRODUCTS

Two new piston rings, known as the Special Oil-Wiper and Servus Step-Cut, are announced by the Gill Manufacturing Co., makers of the Gill Interlocking-Joint piston ring, one of the largest selling patented rings.

The Special ring is of the oil-wiping type, with a square oil return space around the bottom. The Servus ring is a high grade step-out ring, designed to meet the demand for a quality ring of this type.

Like the Gill Interlocking-Joint ring, these rings have their tension cast into them, each ring being individually cast out of round, of a special grey iron composition. All rings are also lathe turned for quick seating, lapping themselves in against the cylinder walls to form a seal that is oil-proof and gas-tight, in considerably less time than is ordinarily required.

Manufacture and distribution of these rings is already going forward on a large scale. 36 Gill Piston Ring Co., branches in principal cities assist in the maintenance of stocks of 11,000 sizes and oversizes in the hands of dealers and jobbers throughout the United States.

INLAND COMPANY ANNOUNCES COMPLETE PISTON SERVICE

Announcement that the Inland Products Company is now located in its new, modern three-story plant and is ready to offer to the trade a complete line of piston products was made Nov. 1st by C. C. Miner, President of the company.

To the well-known Inland line,—the Inland Spiral Cut ring and the Inland Oilless ring—has been added the Stepset, a quick-seating step-cut ring in which the tension is set by a newly-developed mechanical process; a full line of semi-steel replacement pistons and high-quality piston pins.

The Inland Products Co. has acquired the services of B. G. Brennan as General Sales Manager. Mr. Brennan has announced that the new products will be marketed in the same manner as the ones heretofore offered by the Inland Products Co.—they will be carried in stock in all sizes at the branch offices of the company.

This announcement is in line with the progressive policy of expansion planned last April when the new personnel took over the active management of the Inland Products Company.

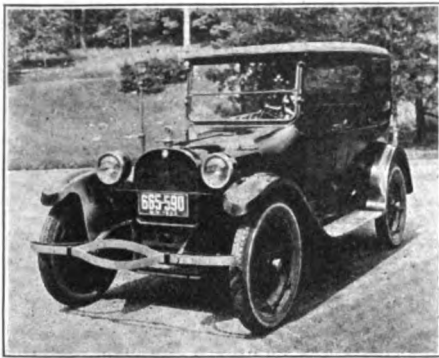
R. L. HEATON MADE AD. MANAGER

As a result of the promotion of L. E. Porter, advertising manager of S. F. Bowser & Co., Ft. Wayne, Ind., pump and tank manufacturers, to assistant general manager, R. L. Heaton has been made advertising manager.

LYON BUMPERS AT THE SHOWS

The Metal Stamping Company, Long Island City, announces that it will exhibit at both the New York and Chicago Automobile Shows as well as at the S. A. E. Exhibition in the latter city.

Not only will the Lyon straight bar, convex, and Dreadnaught bumpers be shown, but also the Vanguard which is soon to be placed on the market.



The Vanguard is a distinctly individual design with graceful lines, intended for the light automobile. It has a broadened bumping surface (both upward and downward) which affords maximum protection, while its extremely simple patented two-piece construction allows for ample adjustment. It is made only of 2" width steel, in either Japan or nickel finish, and may be easily attached with any Lyon standard fittings. The bumper is built in two sizes—Model "A" for cars having a frame width of from 25-1/4 to 28-1/4 inches, and model "B" for 28-1/4 to 31-1/4 inches.

A new universal fitting will also be exhibited. This fitting makes the newest broad-faced designs of Lyon bumpers adjustable and adaptable to practically all cars.

CHANGE IN NAME

The General Piston Ring Company, known until now as the Teetor Manufacturing Company, has been making piston rings for motor builders for the past twelve years. The officers of the Company have relatives at Hagerstown, Indiana, who also manufacture high-grade piston rings under the firm name of the Indiana Piston Ring Company, making the "Teetor" ring.

The fact that the firm name has been Teetor Manufacturing Company and their rings have been "Teetor" rings, has caused some confusion in the mind of the trade. It has been evident that as the Companies grew something should be done, as this Company is about three years the junior of the other one. Hereafter this Company will be known as the General Piston Ring Company and their product as the "General" Piston Ring.

The rings made by this Company are furnished as standard equipment to manufacturers only—a distinctive service. They are not in the replacement business, and their entire attention is devoted exclusively to the requirements of manufactures. In the matter of consistent quality, price and service it is said they can fill the most exacting specifications and give you 100 per cent performance. All inquiries should be sent to General Piston Ring Co. Indianapolis, Ind.

THE NEW STORM CYLINDER FINISHING TOOL

Two views of a new Storm Finishing Tool are shown herewith.

This tool is designed to be used in connection with a special driving mechanism furnished by the manufacturer or with an ordinary drill press. It is an ideal tool for polishing or burnishing cylinders after reaming, reboring or regrinding.

The principal features claimed for it are: First—Speed and efficiency in operation. Second—Perfect mirror working polish produced.

Third—Wide range of capacity.

Fourth—Proper spring tension for any and all diameters of cylinders.

Fifth—Perfect balance of spring pressure and absolute centering.

The tool is of patented scientific construction and its action is novel and interesting. It differs in every way from the ordinary spring grinder sometimes advocated for this work. Any tool to do good accurate work within a cylinder must be perfectly centered with respect thereto or inaccuracy will result.

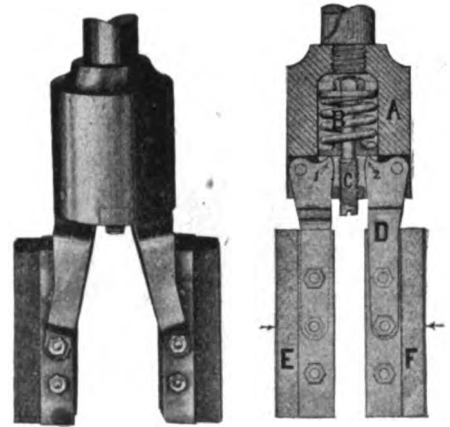
So perfect is the construction and centering action of this tool that in operation the work and tool stand free with respect to each other, that is, they are not clamped or bolted together in any way. This centering action is so strong that it will pull the heaviest type of block into perfect alignment saving time by avoiding the necessity of clamping, and the tool may be operated at full speed without vibration.

CONSTRUCTION OF THE TOOL OR DETAILS OF CONSTRUCTION

The main Body or Chuck (A) carries the heavy compression spring (B) which is held compressed between an upper and lower steel disc carried by the center adjusting arbor. The spring is compressed to about 110 pounds pressure.

The spring pressure is transferred from this lower steel disc to the cams (1 and 2). When the tool is perfectly centered this pressure is evenly divided, 55 lbs. to each of the two cams, but pressure is exerted on both cams *only* when the tool is per-

fectly centered. If the tool is *off* center ever so slightly *all* the pressure, 110 lbs., is immediately transferred to the one cam and consequently against only one stone, the other arm hanging entirely free. This construction acts as a balance, and when the tool is rotated the block is drawn over by the pressure until both cams again ride against the disc. At this point the pressure is equally divided and the work perfectly centered. No universal joints or other flexible means are employed. In fact such parts would defeat the very purpose of the tool.



The tension spring being normally compressed there is no undue spread of the arms when not in use. Proper tension for varied diameters is quickly obtained by simply raising or lowering the spring mechanism within the chuck by turning the center adjusting arbor (C).

The stones used are especially constructed for this purpose and are the result of careful experiments along this line.

The tool leaves a perfect mirror-like finish or working polish of superior quality and while it is primarily intended for finishing after other machining operations it can also be used, where the wear is only slight, for truing up cylinders without previous machining operations.

Full particulars in regard to this tool may be had by writing the Storm Manufacturing Company, Department D, Minneapolis, Minnesota.

ALEMITE LUBRICATING SYSTEM

The Alemite lubricating system, offered as standard equipment on most of the finest cars, can now be had for the Ford, The Bassick Manufacturing Company announcing a special Ford Set, put up in neat package form. It includes four shackle bolts, two king bolts and two tie rod bolts, all of special design and finish, and the regular Alemite fittings for use on the fan, steering gear, rear axle, propeller shaft and universal joint, together with an Alemite compressor that forces grease into the chassis bearing under 500 pounds pressure, and a special wrench for installing the fittings that replace the ordinary oil and grease cups.

NO-FLOAT CARBURETOR FOR FORDS

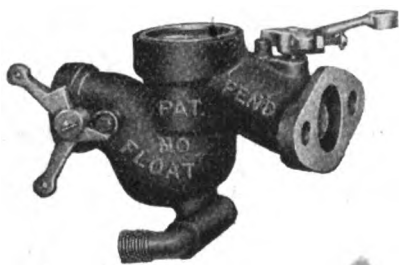
The world has been amazed by the wonderful growth and evolution of the Automobile, every part of which has been improved to meet the new conditions of development with the exception of the Carburetor, which in principal, is the same and only differs in design and deception.

Multiple Jets, Metering Pins, Springs and Levers, and the thousands of other

contrivances used, do not add to efficiency but to complication, making the modern carburetor rather complex.

SIMPLICITY IS EFFICIENCY: The NO-FLOAT Carburetor is made from only 13 pieces, less than half of the parts now used in the lowest carburetors and it will out perform any Carburetor made regardless of cost. Float carburetors become less efficient every day that they are in use because of their many working parts, while the NO-FLOAT Carburetor will always remain the same; nothing to wear.

The NO-FLOAT Carburetor is made without a single adjustment so it does not require an expert to install one. No holes to drill or machine work necessary. You need not worry about anyone getting your carburetor out of adjustment as there is none and it is always ready for action.



The float has been entirely eliminated and in so doing we have created a carburetor that works more after the fashion of a steam engine, doing away with the Vibration when under a strain. The NO-FLOAT Carburetor takes the hills freely without effort, just like coasting. With the NO-FLOAT it is not necessary to take a run at a hill in order to go over the top, just approach the hill at regular speed, open her up and go on over.

The NO-FLOAT Carburetor will pay for itself in 2500 miles running by the saving effected, as well as giving you easy starting, smooth running and wonderful hill climbing. It is controlled by the vacuum of the motor and takes the gasoline just as it needs it, eliminating choking, flooding and wasting fuel.

We find that the constant, or no adjustment feature eliminates to a great extent, excessive carbon in the motor. The writer's car has been run 4500 miles without touching any of the Champion X Plugs or removing carbon and you can't make it knock on a hill! Mr. Morris' car had run 7000 miles before scraping carbon. Too rich a mixture soon fouls plugs. The NO-FLOAT is always properly adjusted, and it can't be changed.

The body of the carburetor is made from Grey Iron Casting and treated with the Parker Rust Proof process. All fittings are made from Yellow Brass which makes a tight joint, making the carburetor proof against any leaks as well as giving it a beautiful appearance. For full information address the manufacturers Huber Morris Co., 219 N. Channing St. Louis, Mo.

"WESTON JR" LINE

"The Weston Electrical Instrument Co. of Newark, N. J. announces new and unique line of small portable instruments for use on alternating-current circuits, known as the "Weston, Jr."

The group comprises Wattmeter, Voltmeter, Ammeters and Milliammeters which will undoubtedly fill a real need in the fac-

tory, the isolated power plant, the central station, the laboratory of the educational institution for field testing, because they are very compact, light in weight and inexpensive in cost.

Weston quality is paramount in their design and construction. They therefore possess the same commendable operating characteristics as are possessed by the other well known Weston Products.

Bulletin 2006 is available to all who are interested."

A. G. UNDERWOOD'S ADVANCEMENT WITH GOODRICH

Mr. A. G. Underwood, for several years prominently identified with the interests of the B. F. Goodrich Rubber Company of Akron, Ohio, has been promoted to the position of Manager of Sales for Goodrich Bicycle Tires; Goodrich Motor-Cycle Tires and Goodrich Automobile Rubber Sundries. Mr. Underwood has been connected with the Goodrich organization for a very long period. He started in with the Diamond Sales Organization on the Pacific Coast; was later on shifted to the position of Branch Manager at Milwaukee and just prior to his taking a position with the central organization at Akron, Ohio, he was Goodrich District Manager of the Minneapolis territory. Tremendously aggressive in his work and with every step in his career marked by unqualified success the promotion of Mr. Underwood is a well deserved honor.

E. C. MINER NOW SALES MANAGER

The Multibestos Company, Walpole, Mass., has announced the appointment as sales manager of E. C. Miner, formerly advertising manager and for the past year assistant sales manager of the company. The Multibestos Company manufactures Multibestos brake lining, Multibestos clutch lining and Multibestos transmission linings for Ford Cars; it also controls the Multibestos Method of relining external brakes in 90 minutes or less, a patented method of brake relining which has been successfully adopted by thousands of garages, service stations and repair shops all over the country since its introduction early in 1922.

HOBBS GRADE AND SURFACE GUIDE

By HOWARD F. HOBBS

Its purpose is to help you intelligently plan and enjoy your trip over the main trunk Highways of the U. S. From a long and varied touring experience through every state, I have learned that the available touring helps are inadequate. To know all about the road surface; what everything costs and where best to buy it, is of paramount interest and importance. Hence this Guide. It will be revised every year.

Its sponsor is the Mohawk Rubber Co., whose reputation for fairness, financial standing and a high grade product is second to none. Because of this, I am associated with them, making possible the sale of this Guide at a very low price.

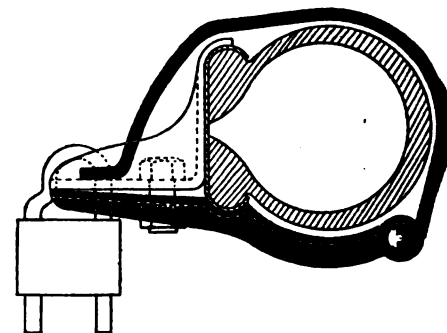
Its distribution is mostly through the concerns mentioned in the Guide in bold faced type; through nearly every Motor Club in the U. S. and by The Mohawk Rubber Co.

Every care has been exercised in compiling the information. However, the time was limited, the work was original

and it was almost impossible to avoid some mistakes. In selecting the business places for commendation, I consulted the Chambers of Commerce, banks and business men. Each comment is unbiased and given without fear or favor, but is necessarily a personal opinion, based entirely upon available local information. For full information regarding this guide address. The Mohawk Rubber Co., Akron, Ohio.

THE NEW HERCULES SPARE TIRE PROTECTOR

The light car owner who wants theft-protection for his spare tire may now obtain a simple, sturdy and effective device known as the Hercules Spare Tire Protector, just placed on the market by the Hercules Manufacturing Company of Indianapolis. It consists of a hinged clamp that fits around the spare tire and rim and attaches them securely to the carrier by means of a padlock passed through both



ends of the clamp and the bracket on the rim band of the tire carrier. The front part of the device is a sturdy malleable casting, which takes the place of the regular wedge used to hold the rim and tire on the carrier. The hinged part is a band of high carbon steel. The device is easily installed by slipping the front part on over the threaded stud from which the original nut and rim wedge have been removed. The nut is then replaced onto the threaded stud and tightened, the hinged band swung up into place and the padlock hooked through both ends of the clamp and tire carrier bracket.

The protector is finished in glossy black enamel and fits outside of the spare tire cover.

MONOGRAM LENS

Monogram Lens Corp., 277 American Circle Building, 1834 Broadway, New York, started business January 1st, 1922. Within 8 months, it was supplying Monogram Lenses as standard equipment for 19 of the best known cars built in this country, representing practically the entire price range.

The lens inventor, S. F. Arbuckle, vice president and general manager of the company, is a leading highway lighting expert. The Monogram Lens is scientifically designed to distribute the light of the headlamps evenly, with a spread of 44 feet, beginning with 1650 candlepower at tips of beam spread and increasing in intensity toward the center until, 80,000 apparent candlepower is obtained in the center or crown of the road.

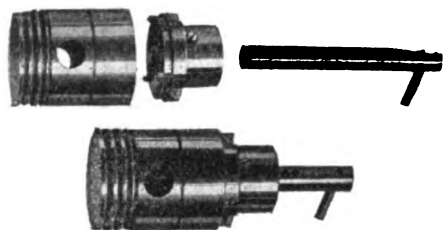
Illumination of 3000 apparent candlepower 20 feet to right and left, 100 feet ahead of the car is given by a pair of headlamps, Monogram-equipped, with 21 candlepower headlights. When focused properly and pointed according to state law

requirements, they deliver three times the ordinary volume of light, it is stated by F. R. Leeds, president.

Patents have been applied for on both lens and design of equipment for mould manufacture. By the method of mould maintenance, the manufacturer is able to guarantee that lenses sold to the public are optically equal to lenses submitted to state authorities for test and approval.

UNIVERSAL TURNING AND GRINDING ARBOR

Pistons of varying diameters from 2 13/16 to 5 inches may be handled with ease by means of the Universal Turning and Grinding Arbor, now being manufactured by the Spencer-Smith Machine Co. Inc., Howell, Mich. Fourteen adapter heads are furnished as a part of this device. The il-

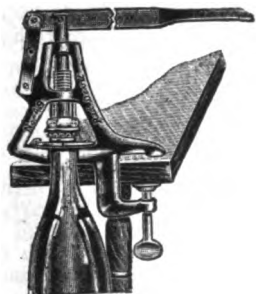


ustrations show the driving arbor, an adapter and piston, previous to assembly, and also assembled ready to be placed in the lathe. Note the holes in the driving arbor by which the same distance between the lathe and grinder centers is always maintained. Full details and prices can be secured by writing the Spencer-Smith Machine Co., Inc., and mentioning this magazine.

"RED DEVIL" BOTTLE CAPPER

The "Red Devil" tool people, the Smith & Hemenway Company, Inc., Irvington, New Jersey, have recently placed on the market a bottle capper embodying a number of excellent features. It will cap all bottles with a standard neck, whether large or small. All bottles are sealed absolutely air-tight.

The operation of the "Red Devil" bottle capper is very simple. The device is fastened to a table, any size bottle is inserted as illustrated, a crown cap is placed over the top of the bottle, and pressure is applied on the handle. The result is a perfect air-tight seal. It is impossible for



the cap to fall out. It is said that there are no parts to get out of order or break. The device is finished in dull nickel, and packed in an individual carton.

The "Red Devil" bottle capper should prove invaluable in the household, and to the housewife, for bottling catsup, root beer, fruit juices, home beverages or any liquid that requires an absolute, air-tight seal.

"MONOGRAM CAP" SALES POLICY

The General Automotive Corporation, 625 W. Jackson Blvd., Chicago, manufacturers of the well known "Monogram" Self Locking Radiator Cap, has recently been admitted to membership in the Automotive Equipment Association.

Jirah D. Cole, recently Field Secretary of the Association and previously Division Manager of the Pyrene Mfg. Company for many years, has been engaged by this Corporation as Supervisor of Merchandising.

This will assist in the maintenance of a consistently clean policy of national distribution for "Monogram Cap," exclusively through efficient and reputable automobile equipment jobbers.

TREXLER COMPANY INCREASES CAPITALIZATION

The Trexler Company of America, makers of various "Trex" automobile accessories, Philadelphia, have increased capital stock from \$200,000 to \$1,500,000, underwritten by George A. Huhn & Son, members of the New York Stock Exchange.

The Company has acquired a fine plant near Wilmington, Delaware, completely equipped for the manufacture of automotive products, with over 125,000 square feet of space, three railroad sidings, and 27-1/2 acres of land.

The following officers were elected at the recent annual meeting: President, H. J. Adair; Vice President, E. J. Flannery; Vice President and Director of Sales, Walter P. Coghlan; Vice President in Charge of Manufacturing, W. G. Penfield; Secretary, E. J. Flannery; Treasurer, Edward S. Perot, Jr.

Several new automobile accessories have been approved by the Engineering Department of the company and will be added to the line of Trex products. Marketing plans for the coming year have been carefully formulated by Mr. Coghlan, who assumed his duties as Director of Sales last month.

THE POWERLITE—A FLASHLIGHT WITHOUT A BATTERY

Americans are familiar with giant electrical power plants. Great size no longer surprises in this field.

But now comes what is possibly the smallest real electrical generator in practical use. You can grasp the complete outfit in your hand, yet it will go on producing current, and light, for years.

The Powerlite has become very popular in Europe, where thousands have been sold. Probably its economy has been the chief cause of its popularity there. But Mr. Anderson, President of The Powerlite Company of Cleveland, states that in this country its efficiency and absolute dependability have proved to be even greater arguments in its favor.

In addition to the ingenious generating magneto, the rest of the construction of this new flashlight is unique and interesting. The mechanism is contained in a "pistol grip" aluminum case that just fits the hand. The fingers of the hand grip a broad lever or trigger which is geared to the magneto in such a way that when the trigger is pulled the magneto revolves rapidly and a bright light appears instantly in the bulb.

The Powerlite has proved particularly useful for farmers, hunters and campers, who are not able to get new batteries when needed. They have welcomed this remark-

able portable light plant that fits both the pocket and the hand. The lantern is out of date now around the barn and yard at night.

Introduction to the cities, however, has disclosed an even larger field for the Powerlite. Among the many users of it now are autoists, meter readers, firemen, watchmen, and housewives, too.



One new development has been the pencil type lamp attachment for the Powerlite, which adapts it to the use of physicians.

America has given so many inventions to Europe, that we sometimes think we have a monopoly on the world's ingenuity. But this little flashlight without a battery seems to be one case where the French showed us a new trick.

Address all inquiries to the Powerlite Company Cleveland, O.

HEXCEL RADIATOR

The HEXCEL Radiator for Ford cars and trucks has just been announced to the American jobbing and retail trade. The HEXCEL is the greatest masterpiece of Fred M. Opitz, who, during the past ten years, obtained an international reputation on another improved radiator invention, around which one of the largest factories in the country was built.

Until the invention of the HEXCEL, radiator design has been standardized on two different types of construction—the fin-and-tube type and the cellular or honeycomb type. Both these types have big points in their favor—the strong features of one type being the weaknesses of the other and vice versa. For example, the big advantage of fin-and-tube type construction was found in the large non-clogging water channels; the big disadvantage was the fact that cooling is accomplished indirectly and consequently heat dissipation is not ideal. In cellular or honeycomb constructions, on the other hand, heat dissipation is very rapid and efficient as there are hundreds of knife-edge points of radiation and most of the metal is in direct contact with water. Water channels, however, are very narrow, irregular and easy clogging.

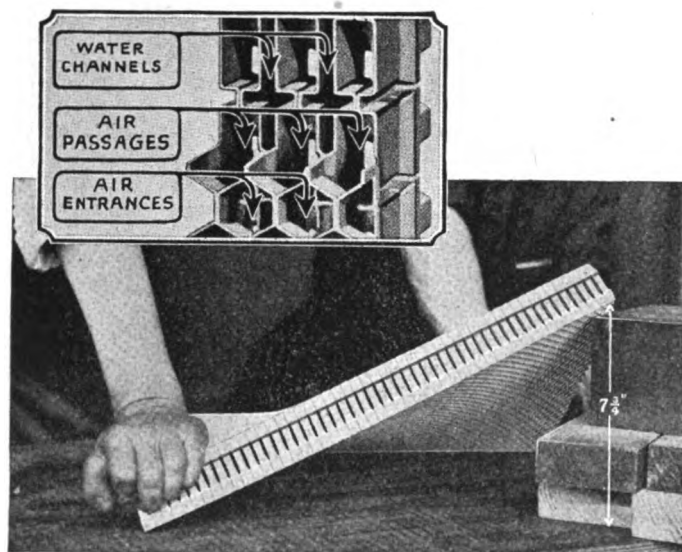
The HEXCEL radiator is the result of Mr. Opitz's life work on a radiator which would combine every good feature of the fin-and-tube type and honeycomb construction and at the same time eliminate their disadvantages. It is fully-patent protected

by 18 allowed claims and is the only radiator in the world to combine the heat dissipating efficiency of honeycomb design with the large non-clogging water channels of fin-and-tube type construction. You can see straight through the entire length of every HEXCEL water channel. There are over 18,000 knife-edge fins and cooling surfaces, yet the air passages are free, clean-cut and cannot clog with dust or mud. The volume of air which can be moved through

ers, a dealer can make up sets for any car, and several sets for the most popular cars.

The covers are made in 2 grades, genuine and imitation leather. They have a felt lining which is saturated with oil when the covers are put on, and the oil is replenished by occasionally squirting a little into the oil hole under the name plate.

The covers make a very neat appearance, and not only keep the springs perfectly lubricated, but also keep out all moisture and



the HEXCEL is tremendous—greater in fact than with any other radiator. A unique construction feature is the fact that HEXCEL air entrances and outlets act as a protection to the water channels of which they are a part. A loose fan could cut a full quarter inch into this radiator without opening up a single channel.

The HEXCEL core defies vibration and jarring and safely withstands freezing. In fact, the HEXCEL is guaranteed for 18 months—the longest guarantee ever given on a radiator. The illustration below, showing a HEXCEL core being twisted out of shape, tells better than words how its construction makes it shock absorbing in itself.

More complete particulars may be secured by writing the Opitz Mfg. Co., Milwaukee, Wis.

AN ADJUSTABLE LACE-ON COVER FOR AUTOMOBILE SPRINGS

The Woodworth Adjustable Lace-On Spring Covers differ from other Lace-On covers in being made adjustable in both length and width. This makes it an easy matter to fit the covers perfectly, and also makes it possible with a small stock, to carry covers for all cars.

The covers are made in 20 standard sizes, from which sets can be made up to fit all passenger cars, excepting the Ford, Chevrolet 490, Overland Small 4, Marmon, Mitchell, and Buick 21 and 22 models, for which special sets are made. The 20 standard sizes consist of 7 lengths and 3 widths of each length, excepting the smallest, of which 2 widths are made. A size list is furnished, showing what sizes are required for all the most commonly used cars. The covers can be obtained from the factory either made up in special sets for the different cars, or in the standard sizes, from which sets can readily be made up, by picking out the covers shown on the size list.

With a stock of only \$60 worth of cov-

dirt, giving the best possible riding conditions, and making the springs so sensitive that they relieve the tires and machinery of strain, and so prolong their life enough to save many times the cost of the covers.



Free advertising matter and dealers' discounts can be obtained from the manufacturers. WOODWORTH SPECIALTIES CO., BINGHAMTON, N. Y.

NEW PORTABLE GRINDER ESPECIALLY DESIGNED FOR REPAIR SHOP WORK

A new portable grinder, Model C, for grinding valves to a fixed angularity and for grinding "reseating" cutters adapted for cutting valve seats to an angularity identical with the valve angularity, has recently been developed by the Franklin Machine & Tool Company of Springfield, Mass.

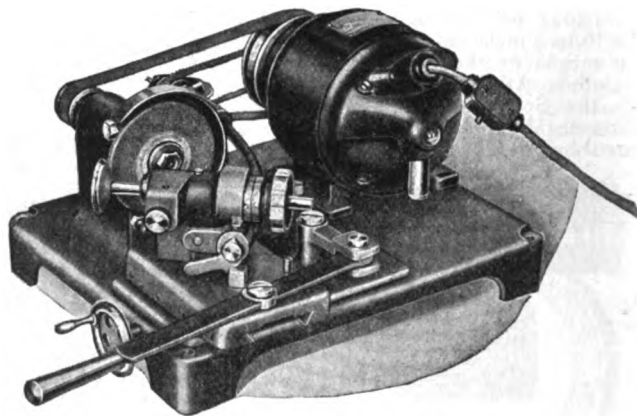
This new "single purpose" grinder, which is especially designed to meet the needs of repair shop work, can be assembled by the manufacturer for grinding valves to any desired angle, but it is not adaptable for adjustment from the angle to which it was originally set at the factory.

The motor, which is manufactured by the Westinghouse Electric & Manufacturing Company, is mounted on a low, flat base and is located far enough from the grinding wheel, the cross slider, and the valve rotating members to prevent any motor vibration affecting the accuracy of the grinding operation.

"MILLERETTE"

The Production Machine Tool Co., 629 East Pearl St., Cincinnati, O., are the makers of a handy quick shift attachment which is said to be an advantage in shops of every size.

The "MILLERETTE" as a wide range lathe attachment is so useful and convenient that it will pay the owner of a machine shop of any size to include it in his working equipment. It takes the place of a Milling Machine for all ordinary purposes or adds additional milling equipment when needed, but requires no extra space and entails no



heavy power consumption.

It can be used not only on Lathes, but on Drill Presses, Shapers and Planers—its usefulness is of as wide a range as the ingenuity of its users.

The "MILLERETTE" on a lathe enables one to cut gears of all kinds—Spur Gears, Bevel, Angle and Internal—to do graduating and milling, surface milling, key seating of all kinds, cutting at required angles, splining and slotting—all regular dividing head, milling machine work.

The "MILLERETTE" on a drill press will, with perfect accuracy, space the holes that are to be drilled.

For divisional work and as a general all-round handy attachment the "MILLERETTE" has no equal.

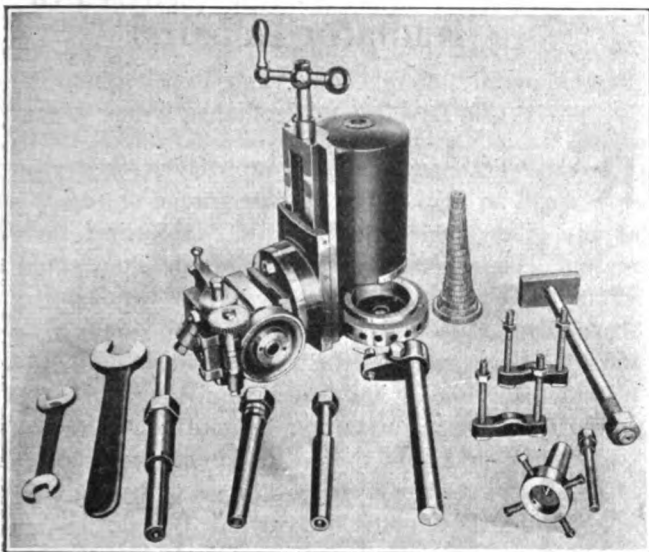
It efficiently handles all heavy work of a size within the range of the lathe. While light in weight there is no sacrifice of strength in its construction.

The "MILLERETTE" is bolted to the tool post slot on the cross side of the lathe with one T bolt and nut, and is ready for action. The lathe carries the cutting tool and furnishes the power, the cross and longitudinal feeds.

It can be set to hold the work in any desired position or at any angle, by rotating it on its base and setting it according to a precise and clean cut scale.

AUTOMATIC PISTOL

It has become almost a necessity for every automobile owner to carry a pistol in order to protect himself and his property, particularly if very much driving is being done at night. A great many garage and accessory dealers are now carrying a line of automatics. The Mauser and Luger Automatics are well known to the sporting and gun dealers everywhere, as being thoroughly reliable and absolutely accurate. Special prices are made to the dealers in auto supplies by A. F. Stoeger 606 West 49th St., New York, who is the sole authorized importer in the United States. Mr. Stoeger also carries a large line of Sporting Rifles and ammunition, both American and



Imported, as well as a complete of extra parts for these firearms.

PNEUMATIC AUTO SEAT

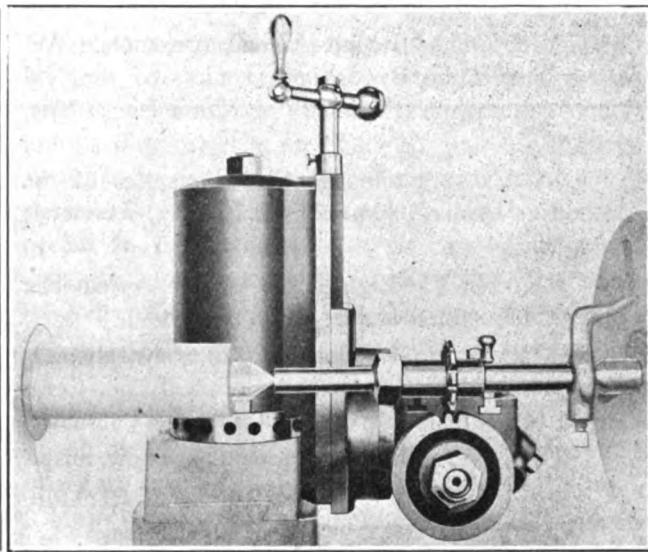
The B. F. Goodrich Rubber Company announces the perfection of a Pneumatic Automobile Seat for Ford cars. According to Goodrich officials the new Auto Seat increases greatly the comfort of driving or riding in a Ford. The seat is adjustable in that it can be filled with as little or as much air as the user desires. No pump is required. The Pneumatic Automobile Seat can be substituted for padded cushions without any alterations. It is handsomely and durably upholstered, and can be deflated and carried whenever desired. The air is evenly distributed, and a level seat insured at all times. Those using it claim that it gives to the Ford all the comfort and shock-absorbing powers of the high priced cars.

THE STIRLING LOCK

For years the motoring public has been subjected to a variety of petty thieving, chief of which has been the loss of motor-meters. Although many devices have come upon the market, designed to safeguard motor-meters against such pilfering, none, unfortunately, has been thief-proof. The illustration shows an effective thief-proof lock, which renders it impossible to remove the motor-meter. The lock has been given the trade-mark name of Stirling Lok. It not only answers its intended purpose but is well designed, graceful and makes an



ornament for any car. It is manufactured by the East Chicago Manufacturing Co., 4426 Olcott Ave., East Chicago, Ill.



THE BLUBLAZE TIMER

The cut gives an idea of the appearance of the Blublaze Timer. It is molded of condensite, which is one of the world's best known insulators. The terminals are all at the top, which enables the motorist to check up the connections at a glance without removing the timer.

These overhead terminals also keep the wires from becoming grease and oil soaked. In addition, they are numbered to corre-



spond to the cylinder to which connection belongs, and are labeled "green," "red," etc., to agree with the color of the timer wires.

Contact is made through a special composition brush made of copper, carbon and graphite which is wiped with even pressure over the highly polished raceway in the timer shell. The composition of the brush is designed to eliminate pitting and also to do away with the necessity of lubricating the timer. The brush gives thousands of miles of service, and is quickly replaceable at trifling cost.

Write Blublaze Motor Specialties Corp., 43 Seventh Ave., Long Island City, N. Y.

AN INNOVATION IN LUBRICATION

It has been the usual practice to pack transmission and rear axle with grease, in the belief that the more grease used, the easier the running, the less liability of wear on parts, and, of course, less frequent greasing. It will surprise most car and truck owners to learn that cars and trucks will run further (without power) from a down hill start without lubrication of their run-

ning parts, than they will with gears and bearings packed with the ordinary greases. This has been proved by actual tests. In order words, packing with ordinary greases retards movement, rather than increases it. It was to overcome the effects of ordinary greases that Mr. S. W. Whitmore, of the Whitmore Manufacturing Co., Lubricating Engineers, Cleveland, Ohio, U. S. A., experimented many years ago until he perfected a type of lubricant that would retain its consistency in any temperature, from 10 degrees below zero to 300 degrees above Fahrenheit. He developed its adhesive quality to such an extent that it could be flattened out under enormous pressure, to the thinnest film without breaking. It is claimed for Whitmore's Lubricants—and the claims are substantiated by tests at the Panama Emergency Dams; by the Hudson Motor Car Co., under racing conditions; and by engineers of big industries—that Whitmore's will prolong the life of gears 500%. It is claimed, also, that if housings are tight, so there is no leakage, one filling of Whitmore's will last for more than a year. Then the lubricant may be drained off, strained and used over and over again. The point of this article is that ordinary greases clog the mechanism of running parts without actually protecting them from quick wear. Frequent fillings are necessary. During the filling operation, trucks are unproductive, and labor costs are run up. Incidentally, though extremely important, replacement of worn parts is expensive, and reduces profits. Whitmore's is not new, but has just been placed on the market. For 29 years the entire output has been absorbed by automobile manufacturers, railroads, electric lines, manufacturers of printing presses, and other big industries. Though it costs more per pound than ordinary lubricants, Whitmore's is really an economy "buy," because it never wears out; cars and trucks run easier, because the lubricant is properly distributed over every part of the metal without "packing"; running parts wear longer, because there is no wear except on the lubricant itself; labor costs are reduced, because only ONE filling is necessary during a year's time; and even if there is leakage, Whitmore's will lubricate perfectly with only a thin film of it left on the gears. For the operator of a fleet of trucks, or the individual truck owner, Whitmore's comes as an innovation in lubricants; one that should prove a big money saver and an improver of truck service.

Show Calendar

- CINCINNATI, Ohio**—Second Annual Automobile Accessory and Radio Exposition, auspices of the National Automobile Chamber of Commerce; Nov. 22-29.
- PASADENA, Cal.**—Automobile Show, auspices of the Motor Car Dealers' Assn., E. C. Lindley, secretary; December.
- NEW YORK, N. Y.**—Eighteenth Annual Automobile Salon, Commodore Hotel; Dec. 3-9.
- PHILADELPHIA, Pa.**—Passenger Car Show, auspices of the Philadelphia Automobile Trade Assn., Commercial Museum, Louis C. Block, manager; January.
- NEW YORK, N. Y.**—National Automobile Show, auspices of the National Automobile Chamber of Commerce, Grand Central Palace; Jan. 6-13.
- NEW YORK, N. Y.**—Second National Automobile Body Builders' Show, auspices of the Automobile Body Builders' Assn., 12 Regiment Armory; Jan. 8-13.
- CLEVELAND, Ohio**—Annual Winter Show, auspices of the Cleveland Automobile Manufacturers' and Dealers' Assn.; Jan. 20-27.
- CHICAGO, Ill.**—National Automobile Show, auspices of the National Automobile Chamber of Commerce, Coliseum; Jan. 27-Feb. 3.
- CHICAGO, Ill.**—Annual Automobile Salon, auspices of the National Automobile Chamber of Commerce, Drake Hotel; Jan. 27-Feb. 3.
- HARTFORD, Conn.**—Automobile Show, auspices of the Hartford Automobile Dealers' Assn., State Armory, Arthur Fifott, manager; February.
- MINNEAPOLIS, Minn.**—Annual Automobile Show, auspices of the Minneapolis Automobile Trade Assn., W. R. Wilmot, manager; Feb. 3-10.
- NEW YORK, N. Y.**—Annual Automobile Show, auspices of the Brooklyn Motor Vehicle Dealers' Assn., 23 Regiment armory; Feb. 24-Mar. 3.
- SYRACUSE, N. Y.**—Annual Automobile Show, auspices of the Syracuse Automobile Dealers' Assn.; Feb. 26-Mar. 3.
- NEWARK, N. J.**—Annual Automobile Show, auspices of the Newark Auto Trade Assn., Claude E. Holgate, manager; Mar. 10-17.
- BOSTON, Mass.**—Passenger Car, Truck and Accessory Show, auspices of the Boston Automobile Dealers' Assn., Mechanics Building, Chester I. Campbell, manager; Mar. 10-17.
- ATLANTA, Ga.**—3rd Annual Great Southern Automobile Show, City Auditorium. Passenger cars and accessories. V. W. Shepard, Mgr. 22 Edgewood Ave., February 17-24.
- PORTLAND, Ore.**—14th Annual Show of Automobile Dealers' Association of Portland. Municipal Auditorium. Passenger cars, trucks, Tractors and accessories. Ralph J. Staehli, 424 Henry Building, Feb. 12-19.

Tubular One Piece Cores For Radiator Repairs

New Material Offers Garage and Repair Shop Means Of Developing Profitable Trade

RADIATOR repairing has probably figured about as small an item in the average garage or repair shop, as any other single line of work. Of course there's a reason. The average garage or repair shop could not afford to carry on hand a stock of the various size and shaped cores, for replacement in all of the many styles of radiators that come into the shop for repairs. The country car owner either has to wait until new cores are received from the manufacturer or until you have sent his radiator to a "Radiator Specialist," who, perhaps, is located in a neighboring city, and have got it back again.

Recently there was brought to our attention a new material for radiator repair work that we are sure our readers will be glad to hear about. This new material is in the form of a single tubular core section, manufactured in stock lengths and sold at a price that leaves a good margin of profit for the repair man. This new material can be cut and assembled into any size or shape, in a very short time. A square core, cornered core, "V" shaped or round core can be assembled quickly and easily whenever needed. This new material is said to be the only type of core adapted to use in any shape radiator. It can be assembled readily to supply any cooling capacity desired.

Almost every car owner will go considerably out of his way, when it is a matter of saving "days" on a radiator repair job. If you advertise the fact that you are equipped to make radiator repairs, the same day the job is brought in, and in a few hours time, you can draw to your shop a great deal of profitable work that is now passing you by.

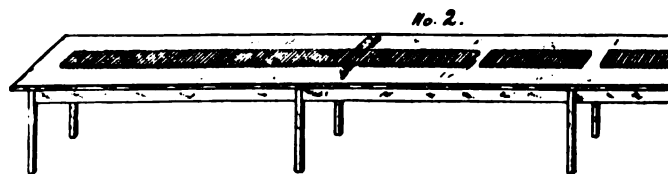
The illustrations clearly show the construction of this new material, which is known as "Zarco." Fig. 1 shows a regular stock strip of Zarco, just as it comes from the manufacturers. These strips can be cut with the ordinary hack saw into pieces of whatever length may be required to make up new core sections. Fig. 2 illustrates the method of cutting the strips into pieces.

Each strip of material contains a row of standard size and quality tubes. The strips may be placed together to form different shapes and sizes. The method of assembly is illustrated in Fig. 3. The strips are soldered together in the head sheets only, thus making it possible to remove or replace any strip desired.

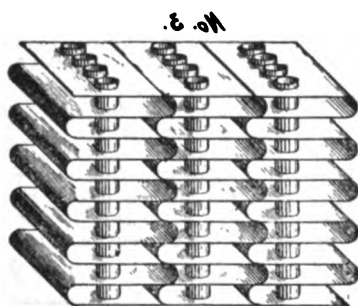
Considering the adaptability and efficiency of this new



material, it goes without saying that shops located in country towns, and at long distances from a source of supply, have now before them the opportunity of secur-



ing a line of work that is very profitable and which can be built up by a little real enterprise and energy, to the point of becoming an important factor in the success of the business. With this new material in stock you will be



prepared for all kinds of radiator repairs, and what is particularly important, you will be prepared to do the work promptly, thus holding trade and making new friends and customers at the same time.

Knew Himself

Judge—"Now I don't expect to see you here again, Rufus."

Rufus—"Not see me here again judge? Why, yo-all ain't a-goin' to resign yo' job, is you, judge?"—*Driven Dan.*

When the owner of this new automobile was sideswiped in Cincinnati, Ohio, he lost control of the car and it crashed with terrific impact against the electric pole and almost wrapped itself around it. He was badly cut by the flying glass and otherwise injured besides having his new machine badly damaged.

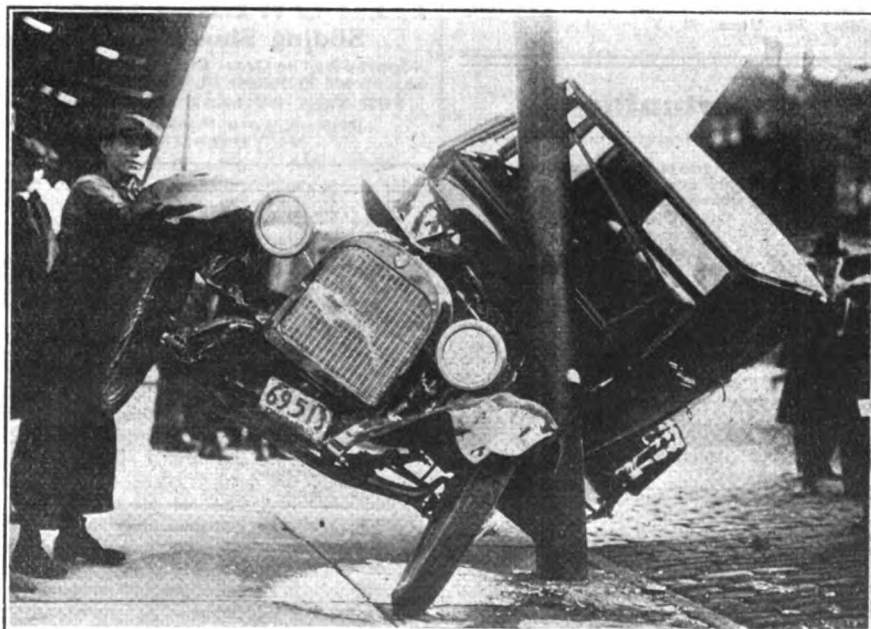


Photo by Keystone View Co.

Looks As Though They Used "Anti-Volstead" Stuff Instead of Gasoline

Repair Case-Hardening

To get this desirable result, the case-hardening should be done not by the rapid methods which are based on potassium cyanide or similar substances but by the box-and-packing-material method. Nor, should the low temperature process be relied on, the process which I have described and which relies on a short, low-temperature period in the furnace. To do case-hardening of the character now being considered, where it is desired to have deep penetration and a shading off of the high to the low carbon contents, one must go to more trouble. Case-hardening of this kind may be done, I think, *with success by the repair man.* Perhaps he will not do work of the very highest grade. But he may, I think, do work of a very acceptable character.

However, let him not regard the matter as a trifling affair, but as a real piece of work, to be done carefully and with due attention to the various details.

The work may be done very well, I think, in any gas or oil furnace capable of getting and holding the temperatures required. These temperatures are not excessive, being round 1600° to 1800°F.—say in the region of heat beginning with *orange* and ending with *yellow*. The reader is not to overlook the point that I did not stop when I required that the furnace should be able to *get* the temperature, but added the requirement that it should be able to *keep* it. This is another matter.

But with a steady flow of gas or with a steady supply of oil, there ought not to be so much trouble. Of course, if the oil furnace is going to let down on its heat now and then, because of some failure of the oil to come through the tip, this would tend to make trouble, because it would just as likely occur when the furnace was not being watched—as, during the night—as when it was being closely attached to.

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Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange at the uniform price of seven cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than one dollar, however small.

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The Wallace Electric Glue Pot

In most shops where glue is used there is much trouble from uneven heating.

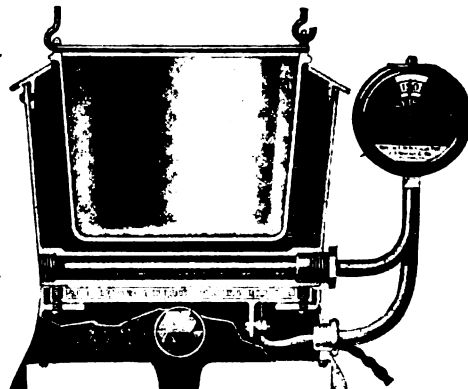
Today, the Wallace Glue Pot, here illustrated, equipped with a reliable, fully automatic heat control device, is filling the need in an efficient and reliable manner.

There are several exceedingly practical and interesting features incorporated in this new bench glue pot the foremost of which is of course the automatic heat control which keeps the temperature of the glue between 140° and 150° at all times.

There is a tube immediately above the heating element containing a sensitive volatile substance which contracts and expands with the slightest change in temperature and provides a dependable action of ample power to actuate the control switch. When the heat reaches the proper temperature the control turns off the current. When the temperature falls a few degrees the heat is

turned on again. Since this action is automatic workmen need not watch the temperature and an increase in production is the direct result. The temperature gauge dial always shows the heat attained and together with the jewel, set in the base casting, acts as a visible check on the heat maintained.

The glue pot operates from any electric lighting circuit and is put in operation by merely turning the switch. The Wallace Bench Glue Pot functions either as a water bath, hot air or dry heat pot and which ever way it is used it can never overheat though the current be left on over night.



There is a durable cast aluminum glue container supported by special retainer lugs which prevent floating when the pot is but partly filled. The escape of moisture is greatly minimized by this method of suspension. The base cover forms a dead air heat insulator chamber between the heating unit and the bench, and the air gap which surrounds the heating unit is further insulation between the heat unit and the base casting. The insulation and control of the current for fire protection have been approved by the Underwriters Laboratories. Part of the bail extends across the center of the pot as a brush wiper eliminating overflow and dripping.

This glue pot is adapted for heating any substance which requires a definite working temperature, such as heating or melting glue, wax, pitch, tar, sealing compound or resin and the following are the principal advantages claimed:

Wholly automatic in action and therefore requires no attention from workmen.

Glue is kept always and invariably at correct temperature for maximum strength and viscosity.

Eliminates losses through spoilage of work due to overcooked or underheated glue.

Maintains heat with minimum expenditure of electricity.

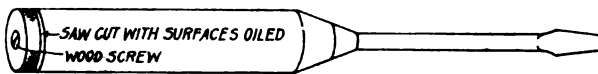
Does not boil, waste nor injure glue from over or under-cooking.

J. D. Wallace & Co. of Chicago make these glue pots in two, four and eight quart sizes and weights range from 20 to 40 lbs.

A Non-Blistering Screw Driven Handle

IT is aggravating to work with a screw driver a little while and then find a small blister on the palm of your hand rapidly growing larger. And that isn't the worst of it, for after the soreness has vanished in a day or two, it again becomes painful when the skin breaks. So, if you have much work to do with a screwdriver and want to spare yourself this annoyance, get a saw and improve it like the one shown.

From the end of the handle cut a thin wafer of wood about one-quarter of an inch thick. This should be held in a vise while the work is being done to hold it rigidly, and it will be well to carefully mark the line of the cut before the saw is used.



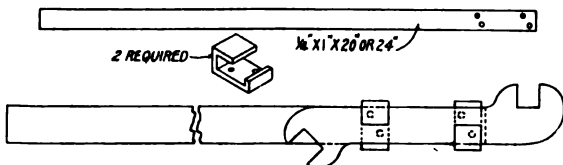
When the wafer has been cut off, smooth both of the surfaces down with a piece of sand-paper held on some flat surface, or with an old file, until the fit is perfect when the two are held together. Now carefully drill a hole in the center of this washer and ream out for the head of a wood screw. This screw should be about one inch long. A small hole may be drilled for the end of the screw before it is placed to prevent splitting of the handle.

After it has been secured with the screw, with enough play to enable the end piece to turn readily, oil the adjacent surfaces with a rather thick oil.

In using this screw driver, with the screw head sunk flush with the wood, there is no possibility of the screw head coming in contact with the hand, and as the hand turns back and forth the wood washer turns with it, thus removing the friction which is the cause of blistered hands. Try it,—it won't take long.

An Extension Wrench Handle

MANY of the small wrought steel wrenches are not long enough to really do much good, especially in tight quarters. On the other hand, bulkier wrenches take up more room in the tool box than they deserve.



The drawing shows a single extension made from a bar of strap steel one-quarter inch thick and one inch wide, twenty-four inches long. If an old file is handy it can be heated and shaped.

Two wrought steel clips such as shown in the illustration are then fashioned and riveted to one end of the bar, one in one position and the other reversed, close enough together to take smallest wrench and with enough play to take the largest.

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Patents Granted
March 20, 1917
March 1, 1921

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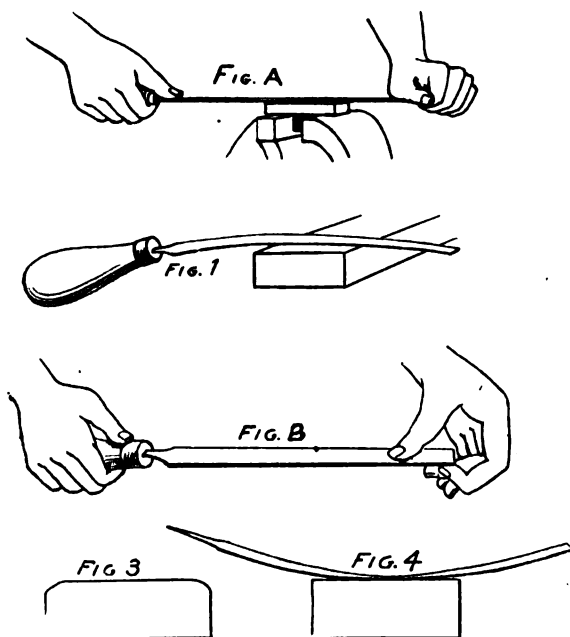
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This extension can be carried outside of the tool box and used in an emergency. It will be found especially valuable in connection with the operation of a tractor.

How to Use a File Correctly

ALTHOUGH files are among the most important tools in any repair shop and therefore are probably also among the most used, it is surprising how many mechanics there are who do not know how to use a file correctly. Experience is, or seems to be, about the only real teacher. The proper method of holding a file is one of the first things the mechanic should learn, for this is an essential in securing desired results. The illustrations show the right and the wrong way to hold a file, when both hands are used. If the file is held as shown in Fig.



A, the result will be about as shown in Fig. 3, due to the bending of the file as shown in Fig. 1. When the file is properly held, as illustrated in Fig. B, it will bend as indicated in Fig. 4, and the result will be a perfectly flat surface, which is as desired.

Files are of many styles and shapes and some are made only for certain kinds of work, and are not to be used for any other. It will pay any repair shop man or mechanic to study the different types of files and their adaptability to the work he has to do.

A Small Pocket Tool

AHANDY tool which can be carried in the pocket is made from the stem and cap from a tire valve. Several small screw-driver blades, a punch, drill and other tools, each interchangeable, are some of the things which can be carried in the cap-container and used. It will be especially convenient for electricians, or motorists, who now and then come in contact with ignition trouble.



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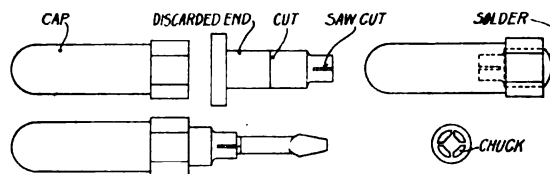
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Reserve the stem and cut it in half, saving the exposed end. The small end is clamped in a vise with wood strips on the outside and with a hack saw, two slots are made across the end, one at right angles to the other, down to the swell. This is then crimped about a square shank, forming the square chuck.

Turn the stem upside down, and with a wood plug in the chuck, fill with solder or lead, and round off the other end with a file. This end is exposed when the tool is closed, but should not extend past the edges of the cut-off stem.

Screw the stem into the cap for about one-quarter inch, with the chuck exposed and it is ready for use. Screw-



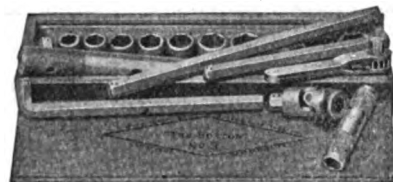
driver blades may be fashioned from smooth, bright nails, or bits of steel.

The interchangeable points should be short enough that they do not interfere with the screwing down of the cap when the stem is reversed, and the points placed inside.

The drawing shows the parts and manner of assembling.

Glass Cutters Smith & Hemenway Co., Inc.	6	Pump, Tire Anthony Company, The	15	Tire Pumps Anthony Co.	15
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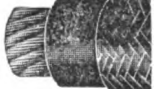
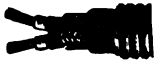
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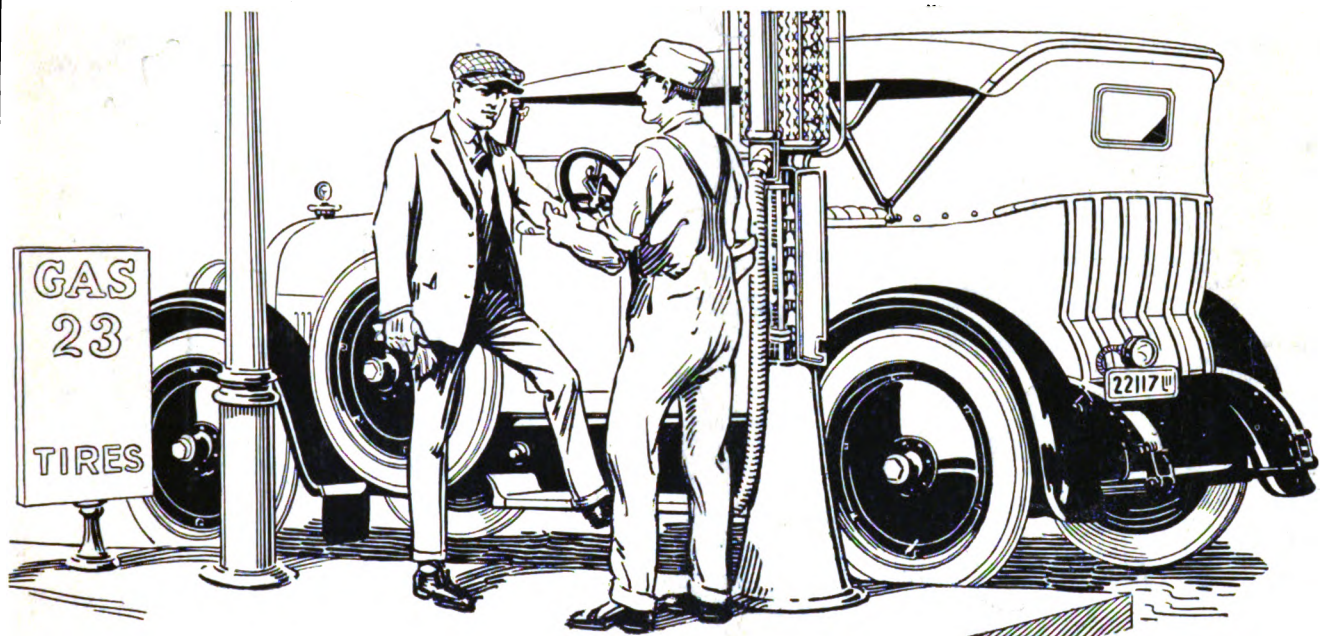
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Vol. 34, No. 4.

DECEMBER, 1922

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**Bigger, Brighter, More Interesting than
Ever, Is the Promise Held Out
for the 1923 Shows**

**Favorable Conditions and Encouraging Pros-
pects for the New Year Indicate an
Unusually Successful Exhibition**

WITH conditions favorable and with the outlook most encouraging, automobile manufacturers and dealers expect the twenty-third National Automobile Shows this year to be record breakers. The displays will be held in Grand Central Palace, New York City, January 6 to 13, and in the Coliseum and Armory, Chicago, January 27 to February 3. Everyone connected with the industry is looking forward to a prosperous year in 1923. According to general opinion, the outlook for credit, finance and sales is of the best.

There have been some changes in the exhibitors' list since the show management issued its preliminary data. A revised list shows that 83 manufacturers will exhibit at New York.

The fact that the show is only a few weeks away has served as usual, to set the motoring world wondering what the exposition will bring to light. Manager S. A. Miles is now engaged in arranging for an unusual decorative setting for the exhibits and is planning other details in order to make the forthcoming exhibition the greatest ever held.

Is the ideal car finally to stand forth in all the radiance of perfection; will the new accessories fill the gaps that have barred the way to perfect comfort; will prices be revised up, down, or across? These, and a thousand other conjectures are filling the mind of the man who owns, or intends to own a car. These are the puzzling questions that are agitating the motorist who feels that the old car should make way in the garage for a new and glittering edition in the year of grace 1923.

Bigger, brighter, more interesting than ever—is the promise that is held out for the 1923 show. It's the same promise that was made for the show a decade ago, and every other annual display ever since. And strangely enough the yearly exposition invariably has lived up to the optimistic predictions of its sponsors. Since the far-gone days in the early part of the century, no National Automobile Show has ever failed to provide a wealth of entertainment, not only for the man who drove a car, but equally so for the man who hoped to.

Right now, although the tickets for the big event have not even been printed nor the "props" assembled, a full house is assured. It has always been so; it probably always will be. The annual review is an assured success because its appeal is as wide as the country itself.

The visitor to the show of 1923 may go with the consciousness that he is—for the first time—paying homage to one of the world's greatest industries. The production of motor cars and their accessories has gradually crept up from the modest figures of early years until at the present time, the industry has gone into third place in the country's commercial standing. Figures indicate that the 1922 aggregate, including the consumption of gasoline and oil, will be in the neighborhood of three billions of dollars.

Whether or not the coming exposition will disclose anything revolutionary or radical will remain a secret until the doors of the Palace are thrown open on January 6th. In every factory throughout the country for months past, the brains of the automotive industry have been engaged

in the design and production of models for 1923. Away from the drop forges, the whirring wheels, from all the distractions of a noisy plant, the designers have evolved ideas of refinements that will mark the cars to be shown.

It is conceded that the coming display will be dominated by the closed types of cars. More and more the motorist is evincing his desire for the acme of travel typified by the limousine, the sedan, the coupe and the various combinations of these three standard types put out with more or less whimsical names. Protection from the weather; when protection is needed, explains the great and growing popularity of the closed car, taken in conjunction with improved body design which in balmy weather permits of all the advantages of an open model.

Each year has brought greater luxury of interior fittings and upholstery, to such a pronounced degree that

even the lowest priced cars have needed to make no apology for their lack of riding comfort. It is safe to assume that the models in the Palace Show will demonstrate superiority over all previous efforts in this line.

The accessory makers confine their new products to no particular time of the year, but the most important are usually reserved for the National Show. Many hundreds of accessory exhibitors are already listed, and the motorist will find a journey among the displays quite as fascinating and informative as in previous years. And he is certain to find some surprises.

With 83 different makes of automobiles and 290 accessory manufacturers listed as exhibitors, the National Automobile Shows of New York and Chicago will be the biggest automobile exhibitions ever presented in this country.

Eight Nations Represented At Importers Salon

**Eighteenth Annual Exhibition, [Held at
Hotel Commodore, Really an [Inter-
national Show—Newest Designs In
Coachwork a Feature of Display**

THE leading cars of eight different nations with the initial display of 1923 fashions in coachwork of the foremost builders of custom bodies, constituted the chief feature of the eighteenth annual automobile salon, held at the Hotel Commodore, New York City, beginning December 4th. The entire ballroom floor of the famous hotel was required to house the exhibits.

Besides the United States, other nations represented were England, France, Belgium, Italy, Germany, Austria, and Spain. Twenty-six makes of fine cars were on display. There were also twelve exhibits of custom body designs and the latest models of a dozen others all to be seen among the eighty or ninety-odd cars shown.

The number of foreign cars exhibited was the largest since 1914. The number of American cars deserving a place among the finest was also notable. The foreign nations represented are all of those that have an automobile manufacturing industry of any importance.

The Steyr, a car of Austrian make, entirely new to America, was displayed for the first time in this country. This new car is rather an unusual one. It is of the six cylinder type, medium weight and medium price, and the design embodies practically all that has been accomplished in the way of progress in the European engineering field since 1914.

Benz & Cie, sole distributors of the Benz in this country, exhibited a de luxe cabriolet, an inside drive limousine with gold fittings, a six passenger touring car and a town brougham.

The return of the famous French Hotchkiss car to America was a surprise of the salon. The Hotchkiss is one of the best known cars of Europe and is of special interest in this country because the Hotchkiss company

was founded, it is said, in France in 1871 by the eminent American engineer, Benjamin Berckly Hotchkiss.

The Isotta-Fraschini Company exhibited cars with front wheel brakes, and an eight cylinder motored stock car, with all eight cylinders in a straight line. The exhibits show the tendency of European makers to adopt this type in place of the V type motor.

The Sunbeam Motors displayed a six cylinder limousine landaulette and a six cylinder chassis. These cars have recently been reduced in price.

Three Minerva cars shown by the Brooks-Ostruk Co., display a new note in body building. One of these cars was a cabriolet, with a number of entirely new features, the most striking being a raised panel effect which starts at the radiator, goes back to the hood in the form of a molding, extending along the length of the hood and cowl and windshield.

A special new type of sedan cabriolet, mounted on a Peerless eight chassis, was shown by the Rubay Company, Cleveland, Ohio. The top is permanent. Window frames are nickel plated and create an attractive appearance to the interior. As a closed car there is a maximum space of one and a half inches at the door hinge line where in the past there has been at least four inches. This gives the driver and passengers a wider view of the road at the side. This car is converted to the open type through the panels next to the door, which are hinged at the base line and when opened form a compartment into which the frames, when folded, drop and fasten securely. This feature has been patented by the Rubay Company.

A number of new features were seen in the Fiat four passenger, de luxe sedan and the de luxe four passenger touring.

The suburban limousine, an entirely new design of the Rolls-Royce, is a very distinctive, as well as roomy and comfortable body design, with very fine lines. There were also shown a sedan, town brougham and four passenger phaeton.

The New Winton Six Sedan is a combination of the Winton built engine and chassis with greater refinement of line and detail in body design and construction.

The Turning Lathe in the Repair Shop

The Man Who Knows How to Use His Machine Can Turn Out a Surprising Number of Different Jobs

BY F. J. SPANGE

THE lathe is perhaps the most universally applied machine tool in the world. There are, it is very true, many varieties of lathes, but the regulation engine lathe with its lead screw and the usual accessories is perhaps the most wonderful of all. At any rate, it is just about the best piece of metal cutting machinery that the repair shop can install.

The reason underlying this is the fact that so many different kinds of jobs can be done on it.

You can do the whole or a very large part of the work on a bolt or screw, whether required with a standard number of threads per inch or an odd number; you can bore out a cylinder; you can make a bushing or sleeve; you can thread a nut or cut a large inside thread; you can turn journal bearings and bore out bearing blocks; and you can do multitudes of other similar jobs. You can cut steel, cast iron, brass and other metals. You can finish work rough or smooth. You can put on a knurl or form a milled edge. You can cut cylindrical surfaces, shape the faces of disks and other flat work, and even make tapered surfaces.

The engine lathe, is indeed a wonderful all-round tool. It is about the best friend in the shape of a machine that the automobile repair man can have in his shop.

It is necessary, however, to have a proper lathe. The workman can learn. With a good man who knows his machine and how to operate it, the shop can turn out a wonderfully large number of different jobs.

THREAD CUTTING

Suppose we begin with *thread-cutting*—not because it is the easiest job, rather because it is such a useful thing. Threads are of two general classes, external and internal. If one studies and understands the principles governing successful, accurate cutting of external threads, he will probably have but little difficulty with internal ones. Unless the contrary is indicated, I am to be understood as meaning external threads in what follows whenever the simple term *thread* is employed.

Threads may be cut in two ways on the engine lathe. (1) They may be cut on cylindrical work arranged on the lathe so as to run between centers. This is a very accu-

rate method, as processes generally are that are carried out on work set between centers. But (2) threads may also be cut on work mounted on the face plate. Such work is apt to be less accurate, but the conditions may be such as to make necessary the use of this method.

In either case—whether the work runs between centers, or whether it is mounted on the face plate—the *lead screw* controls the lengthwise movement of the thread cutting tool. That is to say, the carriage together with the tool post and the tool is shifted lengthwise the work by the rotating lead screw. There is on the carriage the equivalent of a nut. The thread of this nut and the thread of

the lead screw engage each other. The rotation of the lead screw shifts the carriage forward or backward in such way that the shift has an *unvarying* relation to the rotation of the work. This requires explanation. And, unless the reader is thoroughly informed upon this matter it will be well to master it as it is now explained.

At the left-hand end of an engine lathe, there will generally be a system of gears through which the lead screw is driven. The drive comes from the spindle of the lathe. The object in connecting the spindle and the lead screw is to force *team work between*

spindle and carriage. They are compelled to work together. The purpose of this will be best understood perhaps by means of an example.

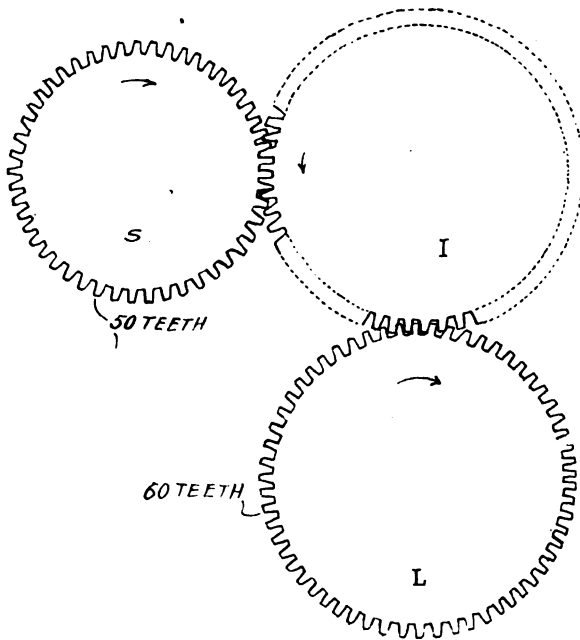
Suppose that the thread on the lead screw makes six complete turns in every inch of length of the screw. Then the carriage will advance or retreat 1 inch every 6 turns of the lead screw. It may be gathered from this that the rotational speed of the lead screw governs the forward and backward movements of the carriage. In fact, just as soon as you know the pitch of the thread on the lead screw—that is, in effect, the number of turns per inch—as soon as you know the pitch you can determine how many times the screw will have to turn round in order to shift the carriage 1 inch. If the lead screw has a thread making 8 turns to the inch, then the lead screw must rotate 8 turns to shift the carriage 1 inch.

It may be seen from the foregoing that the shift of the carriage is absolutely controlled by the rotation of the gear on the end of the lead screw at the left-hand end of

The diversity of work of which a lathe is capable stamps it at once as one of the most important machines in a repair shop or service station. With proper attachments it can be used for cutting key-ways and other milling work. Numerous attachments infinitely widen its range of work. A good lathe is a good investment. It takes the place of a number of separate machines.

the machine. It is very fortunate that something of the kind is so, as we are thus enabled to make the spindle and the carriage work together. In fact, by means of the connecting gears, we can make the carriage shift in accordance with the number of rotations of the spindle. That is, we can fix things so that every time the spindle makes 1 turn, the carriage will shift just the fraction of an inch we want.

Thus, we can arrange the gears so that every time the



spindle turns around once, the carriage will shift $1/6$ inch. To do this in the case where the lead screw thread has 6 turns to the inch is very simple. All we have to do is to arrange the gears so that when the spindle turns once the lead screw will also turn once. One turn of the spindle will then force the carriage to shift just $1/6$ inch.

If the lead screw has a thread making 5 turns to the inch, we can still arrange things to carry out the programme. The lead screw must now be compelled to rotate slower than the spindle. In fact, we want a 1 inch shift with every 6 turns of the spindle. We get a 1 inch shift with 5 turns of the screw. So, what we want is a gear arrangement that will enable 6 turns of the spindle to bring about 5 turns of the screw. A gear on the spindle having 50 cogs and a gear on the screw having 60 cogs will accomplish what we want. We can prove this in the following way. When the spindle has turned round 6 times, it will have moved 300 cogs past a given point. The 60 cogs on the gear of the screw will accordingly have to turn the screw exactly 5 turns. Consequently, 6 turns of the spindle force 5 turns of the screw and that is what we want.

In the foregoing, nothing was said of any gears between the one on the spindle and the one on the lead screw. It is quite usual to have one or more intermediate gears. They do not change the control of the spindle gear exercised upon the lead screw gear, except for the one thing

of *direction of rotation*. When the spindle gear meshes directly with the lead screw gear, the spindle and the lead screw will rotate in opposite directions. If *one* intermediate gear be placed between, the spindle and the lead screw will rotate in the same direction. These intermediate gears have two uses, neither of which interferes with the team work between spindle and carriage, except in the one point of direction. However, intermediate gears enable us to manage the direction of movement, *one* intermediate gear causing the lead screw to rotate in the same direction as the spindle and *two* bring back the opposite direction of rotation. This is one service—they enable us to control the direction. The other service they perform is to bridge the interval between spindle gear and lead screw gear.

I am not going into the whole matter of explaining how to choose gears to get any and every thread almost that one may desire. Let the simple explanation already given suffice for the moment. Perhaps the more complete explanation may be given later on.

The operator has at his command the means of providing a shift lengthwise that will be exactly what is wanted whether the spindle turns the work fast or slow.

It may be well to point out, however, one or two points concerning accurate work. The lead screw thread and the "nut" thread on the carriage should work together smoothly, but *without play*. If both threads have been properly cut by the manufacturer, this will be the case.

Next, there should be a generous amount of thread on the carriage. Let the reader reflect a moment. When the carriage is holding the cutting tool up against the work and continually shoving it on lengthwise, there is resistance naturally. This resistance is felt in the co-operating threads of carriage and lead screw. The result is, of course, both threads will wear. More or less looseness will appear in the course of time. There are two things to do. (1) Watch out for this looseness, or play, between the two threads and replace the thread on the carriage as soon as possible, or else the lead screw if that seems better. This is one thing to do. The other is so to use the lathe in screw cutting as to reduce the double wear to the lowest possible point. Proper oiling is the thing. Do not save a little money and buy inferior oil. Get the best quality of the kind recommended by the manufacturer.

I might add a third thing. A large part of the work performed by the lead screw will be in connection with threads cut on work mounted between centers. The operator may often choose the region along the length of the lathe where the actual cutting will take place. By varying the location of the cutting, he may manage things so as to use various parts of the lead screw. The idea is to avoid using one or a few parts of the lead screw so much more than other parts. In other words, seek to distribute the wear on the lead screw.

The gears at the left-hand end of the lathe should mesh so as to operate without play. The operator is to watch for loose working among the gears, and correct it by replacing the gears or by some equivalent method if there is one.

If, however, the lathe is old or has been misused, there may be more or less looseness amongst the gears or between the carriage and lead screw. This is a bad situation, if accurate threads are to be cut. However, the wear may be of an even character. The gears may be evenly worn, so that when once they are started up the play will all be taken up and a smooth running be manifested. Similarly, the wear on the lead screw may not be irregular. It may be pretty much the same as with the gears. If this is the case, there will be probably no play after the screw has once started to shift the carriage.

Now, if the lathe has suffered wear in such way that once started, the play between the lead screw and carriage and amongst the gears all disappears and these parts operate firmly and smoothly, then we can probably still do some accurate work. That is, we operate the lathe in such a way that there is no chance for play to set in at any time *during the cutting*. We are interested now in the question, When does play or looseness get an opportunity to develop? When the lathe has stopped and needs to be started up again, we may look for play at the first start off. How are we going to avoid inaccurate work because of this play at the very beginning. When the lathe starts and the looseness is taken up, there would seem to be a chance for bad results. But it may be possible for the operator to avoid having the tool up against the work at this juncture. When he does bring the tool again into action, let him make sure that the cutting edge of the tool is going to come up against the work in just the right position.

But play probably has a chance while the lathe is running, if the speed is changed. The thing for the operator to do, then, is to avoid changes of speed while a cut is being taken.

These suggestions are given for whatever the operator may find useful in them. I am suggesting how to better a bad situation, not how to do the ideal thing.

However, looseness amongst gears and between carriage and lead screw is not the only source of inaccuracy in the cutting of screw threads. But it is probably the chief reason for an irregular pitch of thread.

The spindle may operate loosely in its bearing boxes. Spindle bearings and box bearings may be out of round. But these things probably have little effect on the pitch. They may very well have to do with variation in the diameter of the screw. But that is a different thing.

In a succeeding article, I propose to go on with the topic of thread cutting. It is one of the most useful things to understand. At any moment, the repair man may be required to cut a thread and to cut it with accuracy and reasonable rapidity.

Man wonders what is going to happen after death. But about the only thing he knows for sure is that somebody will get his job, and perhaps do the work better.

Before you condemn an employe for disagreeing with you, consider carefully whether that employe may not possibly be right.

The "Pull You Out"

NO particular section of the country has a monopoly of mud but Missouri has its share. In the southwest corner of this state, an inventor arranged a device on his automobile by means of which he pulls himself out of the mud. Across the front of the machine is provided a shaft and small drum wound about with a cable. This can be driven by a worm gear which is on line with the engine shaft, and which can be connected to it by



THE "PULL YOU OUT"

means of a sleeve containing slots which can be moved along the shaft and made to engage two short pins near the end of an extension of the engine shaft.

Whenever the machine is mired, one end of the cable is hitched to a convenient tree or post—the engine is connected to drive the drum—and when the engine is started the machine majestically pulls itself from the mud. This is called a "Pull-you-out."

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How to Properly Adjust Brakes

Important Points That Must Be Observed in Adjusting and Repairing Brakes—The Repairman Can Make This a Profitable Line

BY DONALD HAMPSON

A GROUP of men were discussing the various ways of coasting and which was the safest, which was the easiest on the mechanism of the car. These ways may be named, as, shifting into second gear, cutting off the ignition and using the braking power of compression, throwing out of gear or holding out the clutch so that the car actually coasts, and using one or both brakes. As a clincher, the group appealed to an acquaintance who was passing. "What do I do on a hill? I throw everything out and let her slide—I enjoy the sensation more than a week's vacation. But then, I always have two good brakes to depend on."

There is food for a world of thought in that last remark. How many cars have good brakes? How many car owners known what to do for their brakes aside from screwing a turnbuckle? It is to make clearer this most important system that the present article is written.

A few cars are built with a brake on a shaft in or near the transmission and with the other brake acting on the rear wheel drums—Fords are so built and the remainder lie mostly in the higher priced class of light weight. But the great majority of makes have a pressed steel drum attached to each rear wheel hub with a band brake surrounding the outside (the service brake) and with two metal or metal lined shoes bearing against the inside (the emergency brake).

Because Ford parts are so cheap, it does not pay to repair them. We are all familiar with the cast iron brake shoes which go inside the rear drums—it is a simple matter to replace them. The task of replacing the transmission brake is not so simple and is usually relegated to garage men, though the owner can do it himself if he has patience and the assistance of a helper—even then he will find that it takes them two hours at least of the dirtiest, most exasperating work he ever undertook. For those who have braved this job, it will be cheering to know that there has been put upon the market an accessory that enables one person to install an entire new set of Ford bands in less than half an hour—pending the time when Mr. Owner buys one of these, he had better leave the Ford service brake to garage men.

Three conditions must be satisfied in order to pronounce a car's brakes in good shape. They are—wearing surfaces must be in good condition, parts must be adjusted to grip in the manner designed, and the brakes must be adjusted so that each wheel does half of the work of stopping the car.

The service brake requires the most attention for its constant use wears out the lining quite rapidly. We are

going to dwell strongly on this very attention for, unknowingly and unthinkingly, the car owner takes up this wear in the worst possible manner and thereby doubles his brake maintenance expense at the same time that he halves his brake efficiency.

We all know about the spring steel metal band that surrounds the brake drum and to which is rivetted the lining. Most of us have put on these linings ourselves. There is no secret about it—get the lining so it lies flat against the band (free from puckers) and be sure that the rivet heads are well below the surface. The latter is very important, for a single rivet that projects will prevent the lining from taking hold within two or three inches and that rivet will score the brake drum.

Asbestos linings are in universal use. The lining is a very tough, close woven cloth band into which asbestos has been introduced before heat treatment and which is often further strengthened by strands of copper wire. Asbestos does not add strength—it is put in for fireproofing purposes.

To best realize the need of asbestos linings (and the reason why they cost so much) one must live in or tour through a hilly country. Not far from us are the Wurtsboro hills on the Buffalo trunk line—here, in less than six miles, the road includes a total difference in elevation of 1700 feet in three long slopes—long continued braking, which is the severest test for linings. In former days when linings had not reached their present degree of perfection (and also when the section more nearly lived up to its appellation of "Wurtsburger Hills"), it was a constant thing to see cars descending with flaming brakes or motorists stopped and frantically scraping sand to hurl at the fire.

Asbestos does not add to the wearing qualities. If one lives in flat country or rides in the city only, a lining that is not asbestos will do fully as well and cost but half as much. Manufacturers of woven belts invariably try out their belting in the brakes of their cars—in fact, for the road conditions mentioned, this belting answers every purpose as it is built of the same materials, woven the same way, that the same manufacturers use in their brake lining products.

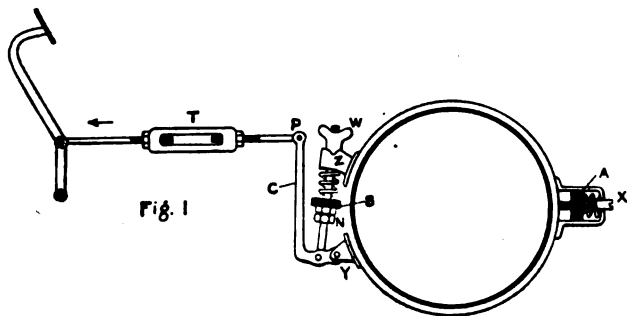
DECIDE WHAT NEEDS ATTENTION

When brakes do not hold, the first thing to determine is whether they need adjusting or re-lining. This can best be done by removing the wheel. If the lining is not worn down to the rivets, it does not need to be changed; in many cases the old lining will serve for a long time yet

if the rivets are sunk in deeper. Invariably, the lining is worn more at the open ends than at the back—this is chiefly the result of misadjustment, though it is always true to a minor extent anyway.

Brake bands are suspended from two stationary points, A and B, and are adjusted at three points, X, Y, and Z. In the drawing, certain details are exaggerated for greater clearness. The parts A and B are extensions from the brake housing which is riveted to the rear axle and their position cannot be changed; the other parts are all movable. Because the brakes are apt to be covered with dust and mud and there seems to be a multiplicity of levers and arms, most people neglect the brakes altogether and do not study out the really simple mechanism.

At the front, is a toggle joint that draws the free ends of the band toward each other when the foot pedal is depressed—a mechanical movement as old as the hills, and as simple. A thumb, or wing, nut W near the top is put there for adjusting puposes but not for exclusive adjustments, though its appearance and its convenient position invite the owner who finds his brakes weak.



The move in properly adjusting brakes is to jack up the rear end. Raise the car so both wheels are clear of the ground—you don't need this for individual adjustments but you have to have it for equalizing so it is better to make one job of it. Two jacks may be used but they do not form a very stable support and it is far better to raise one side so a box or blocking may be placed under the axle and then to use the jack under the opposite side only.

Many axles have truss rods under them and because these axles are inconvenient to jack up, one is disposed to dodge the issue by getting along with an insecure support. Nothing could be more risky. Besides bad scares and minor injuries, fingers have been lost when these insecure supports tipped over and caught the unfortunate workman. The second drawing shows how to support a trussed axle—it is a method that is quick, solid, and safe. The parts used may vary according to the owner's supplies, but so long as he places his weight so it comes over the heads of a box, not in the center of the bottom board, he is perfectly secure.

Having raised the rear end, the brake mechanism must next be disconnected from the pull rod. This is done by removing the pin P (but one is shown in the drawing though on the car there are two or three places on the arms just ahead of the axle where a pin can be removed)

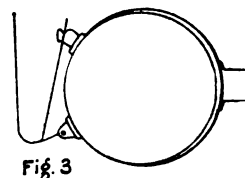
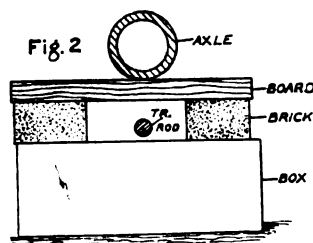
which is preferably the one at the upper end of the lever C.

The first adjustment is made at the rear by means of the set screw X. Unless the adjustments have been kept up in shape, it will be noticed that there is nearly an eighth of an inch space between the drum and the band at the rear. This should not be so—it means that when the brake is applied, the bands come together as in Fig. 3. Only the front half touches the drum—often less—and the result is a squealing, poor holding brake that does not last out half its life.

From the drawing, Fig. 1, it may be assumed that a pull on the toggle would draw the entire band forward and thus give a complete contact around the circumference. This would be true and would take place upon compression of the spring S were it not for mud, rust, and lack of lubrication between the block A and the surrounding brake carrier, which is made a snug sliding fit for obvious reasons.

But because of the action of the elements, the band must be adjusted forward by the set screw until it is within $1/32''$ or less of the drum. Even if so close that the drum can be heard to drag as the wheel is turned by hand, that setting is preferable to the wide open space. Having done this, put the cotter back through the set screw. Also see that the sliding surfaces on the block A and its mating piece are thoroughly oiled. It is the function of the spring to keep the band away from the drum as far away as screw X permits, but it cannot do this if mud and rust hold the floor. This rear adjustment is the most important one to be made.

Next, it will be observed that the bands are now very much open at the front. The nuts N control the setting of the lower half and the thumb nut W controls the upper half. By turning the nuts N *downward*, the heavy spring draws the lower end of the band *upward*; this



movement should continue until the band is within about $1/32''$ of the drum, when the nuts should be tightened on one another so they will not jar loose.

Lastly, the thumb nut W is turned until it brings the upper half of the band in a similar position. No lock nut is here provided because the band bracket is gutter shaped and the spring pressure keeps the gutter against a tapered face on the nut.

Having made these adjustments, and locked them, spin the wheel. See that there is no excessive dragging. See also that a reasonable pull on C draws the band closely all around. These conditions satisfied, make the same adjustments on the other wheel. The distance that it

takes for the pin P to move in making an application of the brake should be roughly the same for each side. Having done all this, replace the pins P and cotter them.

HELPER NEEDED FOR EQUALIZING

An assistant will be needed to make the final adjustment—that of equalizing the pressure on both wheels. Bear in mind that both wheels should turn readily when all connected up. Now, while the assistant presses lightly on the brake pedal, go from one wheel to the other, turning them and calling for more pressure until one wheel is tight.

The pull rod on the side of the tight wheel must be lengthened or the one on the opposite side shortened. In general, it is better to shorten a rod. The turnbuckle T has right and left threads and lock nuts and it is here that rod length is changed. If a big length change has to be made, it is a pretty sure sign that only one brake was doing the work before; the other conclusion that may be made is that one pin P has much more movement than the other and, unless certain of their likeness, this should be again checked up before a change of say, an inch in rod length is made.

After rods have been adjusted so that neither wheel can be turned when the brake is applied hard, it is well to try the brakes on the hill—just to get used to new conditions, if for no other reason. It will be found that much less pressure is required on the pedal and that the car may be stopped with comparatively no effort. In addition to the actual greater safety, the owner acquires a sense of security that adds much to the pleasure of driving and that fully repays for all the work of adjusting.

Internal brakes rarely need adjustment. There are no means provided for adjustment aside from re-lining and turnbuckles on the pull rods. As the internal brakes are used little except for emergencies or to hold the car when parked, they wear very little. This applies both to those which have metal shoes and those which are lined bands.

While the car is blocked up, the internal brakes ought to be equalized—just as for the service brakes—by turnbuckle adjustments. Many accidents occur when speeding drivers get caught in a tight place and grab for the emergency brake with a mighty pull. With unequalized brakes, one wheel is held hard and fast immediately while the other one (through the differential action) goes merrily on—on in a circle about the locked wheel as a pivot. The car usually lands in the ditch. This does occur with improperly adjusted service brakes though not so frequently because they are more apt to be so far worn as to be unable to lock a wheel.

Some states have enacted laws requiring brakes to pass a test. Others are considering such a move as one way to prevent the increasing number of accidents. But until these tests are more rigidly conducted and the laws better enforced than headlight laws, the matter of brakes is one of individual common sense.

In order to better understand the whys of brakes and their use, some knowledge of friction and adhesion is

essential. The friction between a wheel and the road which enables a car to move itself is a resistance to sliding of the wheel on the ground or road. The "coefficient of friction" is the name given to the measure of that resistance in terms of the weight on the wheel; thus, if we have 1000 lb. weight at the point of contact on the road and we can get 500 lb. impelling effort out of this wheel for driving the car, the coefficient of friction is 500 divided by 1000, or .5. Railroad wheels have a coefficient of friction on steel rails from .015 to .35 while rubber tires on various types of roads run as high as .60 to .85.

Now, in stopping the car, we have to use the same friction between tires and road as we do in starting (driving) or hard pulling up a hill, only in braking the direction of the wheel's effort is in the opposite direction; rubber has such a high factor of adhesion that locked wheels will stop the swiftest car in a few feet but we don't want to ruin tires that way so our brakes are designed to make this well nigh impossible at high speed and we have to do the theoretically correct thing which is to partially hold the wheel back so that it exerts a large amount of the driving friction we named but not enough to cause the wheel to slide.

FRICTION IN DIFFERENT FORMS AND PLACES

In rolling along at thirty miles an hour on a smooth level road, it takes but a fraction of rubber's driving power against the road to keep the car moving—that is the kind of friction we have mentioned. Then, while moving, there is friction to overcome in rolling over the ground—that is another kind and is called rolling friction, or wheel resistance. Finally in braking, we deal with a third element of friction, namely, the friction of the brakes which we make use of to stop the car.

The brake friction slows up the wheels and, in doing so, increases the friction at the contact point of wheel and road. Friction at these two points works together. Brake linings have a coefficient of friction as high as .35, from which we learn that if we apply 100 lb. direct pressure the band will be retarding the brake drum with a 35 lb. grip.

BUT, the determining factor in stopping a car is not braking power alone but rather the uncontrollable conditions of weather and speed in connection with it, against which no permanent provision can be made without sacrificing working qualities which we value during normal conditions. Thus a man may have good brakes, well adjusted, but if he rides half an hour in a pouring rain, he will find his service brake has "gone blooey"—that even his emergency does not take hold as it should. Very careful driving must then be resorted to and the engine called upon in descending sharp grades.

This same thing may be noticed after the car is washed—the service brake does not hold well for an hour afterward, or until the lining dries out. When this lining gets wet, its coefficient of friction drops from .35 and .40 to .10 and .15. With metal to metal brakes, a wetting has almost as detrimental an effect. If we made our

(Concluded on Page 45)

"Order a New One and Send the Bill to Us"

Read How One Dealer Handles Complaints and Holds Customers—Keep Your Eyes Open and Your "Think Tank" Receptive

BY A. B. CASSETT

"Because we have a small sized accessory store," said the Boss to the newest clerk, "I would not want you to get the impression that this little 'merry-go-around' is not just as important to us as John Wanamaker's big show house is to him.

"Although I'll admit that you can never tell how big a factory is by the size of its whistle—just the same we do a very large business because we are at the top of the ladder of success. For this very reason we need good men at the foot of the ladder to steady it.

"I noticed a little while ago you seemed to be having an argument with your customer,—I don't care what it was about—only, if it really was a customer with whom you couldn't reason—you should have let him have the last word at once—but that happens so seldom that I am afraid you do not understand that one of the most important phases of producing satisfied customers is the handling of complaints.

"I notice that the clerk who is irritable at his work can exercise a lot of patience when holding the end of a fishing rod! I also notice that a store looks no better to a customer than the man looks who is waiting on that customer—what seemed to be the trouble?"

"Why that man's a darned old loon," yelled the newest clerk. "He brought back a gasoline strainer and said it was an old style thing and that I had taken advantage of his ignorance regarding gasoline strainers. I told him right up and down that it was the best strainer on the market and that I could prove it!"

"Harsh language!" commented the Boss reprovingly. "I heard the man say in rather a brisk fashion that you couldn't prove it on him!"

"But it's true!" insisted the clerk.

"True, me eye!" said the Boss calmly. "All we had in stock were those four old style gasoline strainers and if you let a little light permeate that solid ivory dome of yours—you'll remember that I told you last week to quietly slip them into the junk pile—the new strainers are in the house now—out in the receiving room being unpacked—here comes Eddie with 'em now. Take one of these new strainers over to that man's address and make him a present of it with my compliments—tell him you are sorry you were so positive about the one you sold him being all right—apologize.

"A good salesman is not one who sells the customer something he may not want, but one who sells him and persuades him to believe he is expected back to buy

again, because he has been treated with consideration and given his money's worth.

"Consider service before everything else. Quality alone will not do it, for no matter how good and how dependable a line of goods a dealer may handle, if he is continually out of some goods, or does not make deliveries promptly,



SKID-DOO!
No! Don't Skid—come in—
get your Chains here!

or gets 'grouchy' when a buyer wants something ordered, the patrons will go to some one who gives better service.

"Prices will not get and hold trade, because if it is price alone that people seek they will hunt up their catalogue and send to some big city for their goods. It is good service buyers like. It's a pleasure to most men (and women too) to go into a store and be assured of being able to buy just what they are looking for. It is a further pleasure to them to know that if it is something

out of the ordinary they seek, the proprietor will get it for them just as quickly as the mails or telephone can get in touch with the wholesalers.

"Personally, I believe it isn't because a store is big or small that it succeeds. It is the personnel behind it—there isn't any magical formula that makes any business a success. Willing, courageous humans plentifully mixed with energy and briskly stirred with ambition, that is the recipe.

having a long talk with your man and about all I could catch of the conversation were the words 'ruined cushions.' "

"How did you pacify the man, Johnny?" said the Boss smiling. "Why, I told him to order a new cushion to take the place of the one the oil ruined and send the bill to us—I figured we couldn't afford to lose his trade."

"Not only that," said the Boss, "but it will be one of the best advertisements we've ever had—for Appleton



This Window Background may be painted on a curtain to roll up out of the way so as to make the goods in the window accessible at any time. Any good sign painter will do the work at small cost.

"Now, after you have apologized to this man for having handed him a lemon in the form of a half completed invention sailing under the name of 'Gasoline Strainer'—you can take a day off and go to a good show, but don't go to sleep in your seat—you might snore and actors do not like that kind of applause. On your way out tell Johnny Brown to please step this way.

"Johnny," began the Boss in a low confidential tone, "What was it about that oil can sale?—you seemed to be

happens to be a regular 'Conversation Kenge.' I'll send the bill to the manufacturer and hereafter he'll probably test all his nice appearing oil cans before he sends 'em out.

"Mouth to mouth advertising always adds new customers to the store. We don't always want to get 'em on leaky oil cans, but anybody knows that such a case is only occasional; not the rule.

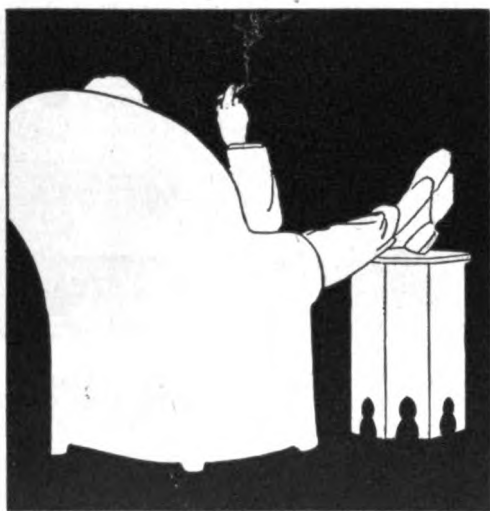
"A dissatisfied customer can do more harm to a store than the cost of the purchase over which the dissatisfac-

tion arose. Therefore, it is well to assume in most cases that a customer is right in any disagreement that may arise.

"My son is keeping company with Mr. Appleton's daughter, and if you hadn't fixed up that little occurrence the way you did, my chance to get added capital in this business would have faded like a cheap blue serge suit exposed to the insistent rays of the summer sun. Johnny, how would you like to go to a good show?"

"I'd like nothing better, sir!" replied Johnny.

"Go to it," said the Boss, giving Johnny the glad hand,



He has decided to order
a set of New Tires and
have the old ones fix-
ed up for reserve.

F. MYERS

"and if the play is good I know you'll give the players applause. On your way out, please send George Williams here."

"George, what was that talk you had with a customer the other day—the man seemed to be dissatisfied."

"Oh, that!" said George, "That was a can of grease—the can was only dented—the grease was all there—it was that first sample can we've had around so long. I wanted to get rid of it!"

"So you thought you'd push it off on to him," said the Boss, letting loose his best hyena laugh. "That can of grease should have been at the bottom of the sea, like McGinty long ago—George, I want to tell you something

—whiskey is not the only curse in the world—narrow mindedness runs it a close second—you lack the broad view—you also lack enthusiasm—why don't you enthuse with your fellow man—I don't mean that you must throw it around idiotically. I know some people who will warm up to a dog, but are all icicles when they come up against the human element.

"Enthusiasm is the witchery of really wanting to do. Enthusiasm is earnestness of purpose, eagerness to be put up front. Self-reliance, self-confidence, hope, expectations, are some of the pillars of man's prosperity. Today, it's go ahead—or go behind—keep up or get off the trail. Today it's the survival of successful men. Every big battle is first lost—then won by an enthusiast.

"You want to learn salesmanship.

"Trying to push a shop-worn article on a customer in these times is the worst kind of an advertisement this accessory shop could have. How would you like to go to a good show George?"

"I'd like it first rate, sir."

"I thought so," said the Boss, who had not as yet caged the hyena laugh, "there's two tickets for a lecture on efficiency by Mr. Fish at Carnegie Hall—but take it from me you'll learn more from practical experience in this store—than Mr. Fish can tell you in a year—but you've got to keep your eyes open and your 'think tank' receptive."

Dents in Sheet Metal Removed by Torch

The oxy-acetylene welding blowpipe is a very effective tool for the removal of bulges and dents in sheet metal and plate of all gauges wherever the bulge or dent is due to enlargement of the surface, however slight. Before the discovery of this application of oxy-acetylene, denting or bulging was a serious problem to sheet metal workers engaged in the production of such articles as automobile bodies, metal doors, office furniture, etc.

There is a right way and there are several wrong ways to deal with bulges and dents where the metal has been "stretched," and fortunately the right way in this case is an easy one. It is to heat the distorted area locally. As the sheet or plate cools, contraction restores the original form, if the operation is properly handled. Of course, the extent of the distortion determines the amount of heating necessary, and this is something for which it would be difficult, if not impossible, to work out definite directions. Even so, with a little experience the average welder acquires facility in gauging the contraction or "take-up" on work of the kind and explicit rules are not needed.

Oxy-acetylene is not the only source of heat that might be used, but it is the most convenient and rapid means of handling the work. It might be well to note that when the bulge is first heated, it becomes more pronounced due to expansion, but at red temperature the

GOOD MACHINE TOOLS ARE ESSENTIAL

metal upsets and tends to thicken. Of course, the heated zone contracts as it cools, and because the excess metal remains somewhat thicker at the center of the bulge than it was when originally heated, the area of the affected part is correspondingly reduced. If just exactly the right amount of heat is applied, the bulge will be entirely removed.

Competent and experienced operators complete a correction of the kind noted in a single operation, says Oxy-Acetylene Tips. So expert do they become that, in automobile body plants, welders are regularly assigned to inspect car bodies before they are painted, and are instructed to apply the torch wherever there is the least indication of warping or denting.

Welders who find it difficult to make rectangular boxes and tanks without warping may improve the appearance of their work also by employing this heating "kink." Warpage may mean that the welder has not correctly handled the expansion and contraction strains. Often with a little experimenting he will be able to use the blow-pipe in the manner described and thereby correct imperfect surfaces in his finished product. It should be remembered, however, that in most sheet metal there are strains due to the rolling, and that where sheets are put through straightening rolls to flatten them, these strains may be so great that even reheating in a furnace will cause the sheet to warp badly. Local heating in such cases will not remove the trouble. The sheets must be heated locally at the edges when welding them. This practice should not be applied to boiler shells.

Tempering Saws With Oxy-Acetylene

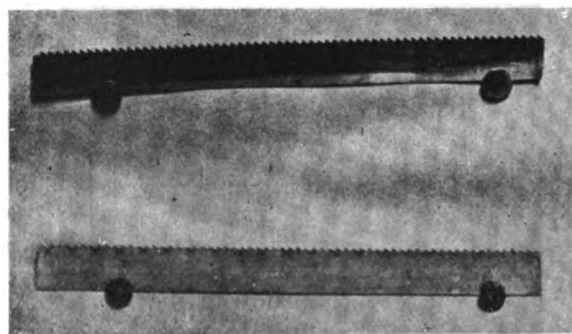
The Oxy-Acetylene Process for Heating

Perhaps no oxy-acetylene application other than welding and cutting has revolutionized a manufacturing practice to a greater extent than has occurred in the tempering of hack-saws and band-saws used for cutting metals. These saws must have a hard cutting edge, while the body of the blade should be relatively soft and ductile. The old method of tempering the saws was to pass them through a slot in a water-cooled cast-iron block, above which only the teeth of the saw would project. Jets of flame were directed against each side of the saw until the upper part was brought to a tempering heat, when the saw was quenched in oil. Compressed air and city gas were used.

Production by this process was slow, due to the fact that the saws would not heat sufficiently if fed rapidly through the slot. Another objection was the fact that the heat was conducted into the body, resulting in the tempering of a considerable portion of that part of the saw which should be ductile. The blades frequently failed in service due to breaking, cracking, bowing at the center or warping sideways. To prevent the hack-saws from breaking when clamped into the holder, it was necessary to reanneal the blades.

These difficulties have been removed by the use of the oxy-acetylene flame for tempering, and the product has been very much improved in other ways. Instead of tempering approximately half of the blade, which was unavoidable by the old process, oxy-acetylene makes it possible to confine the tempering to the teeth and to produce a soft-bodied saw that is practically free from flaws.

Using the oxy-acetylene process, one machine does the work that four machines would formerly do. Moreover, the oxy-acetylene machine is semi-automatic in operation, requiring only periodic attention of one operative, as against the entire time for two operatives for each of the old-style machines. By the oxy-acetylene process it



HACK-SAW BLADES AS TEMPERED (ABOVE) WITH CITY GAS AND COMPRESSED AIR AND (BELOW) WITH OXY-ACETYLENE

is possible to temper sixty-odd feet of saws a minute, which is approximately five times the best speed possible by the old method. The use of oxy-acetylene for tempering has made it possible to maintain constant production, a factor that was not obtainable previously, due to variations in the local gas service. City gas pressures in the winter time were low and production was proportionately cut down, and regardless of the season a fluctuation of the pressure on a single run of saws would develop hard and soft spots which would cause rejection of finished material when subjected to final inspection.

The development of oxy-acetylene tempering, which is now standard in the manufacture of hack-saws and band-saws, is the result of a service rendered to a very well-known manufacturer, says a writer in Oxy-Acetylene Tips. The service was not solicited and at first it was not greatly appreciated, because the manufacturer did not believe that the troubles he was experiencing could be avoided by effecting a change in the tempering process. But while the service engineer was given little encouragement at the outset, his ideas eventually prevailed. Today the oxy-acetylene method is standard to this company's production.

Good judgment has often been termed cowardice.

* * *

A dirty show window is the advertisement of a shiftless store.

* * *

The man who listens to your story is never in the bore class.

A. E. S. C. Approves Standard Light Specification

A RECENT news item in the daily papers furnishes the information that an acceptable set of specifications for automobile lighting equipment seems to have been developed by the American Engineering Standards Committee.

Those automobile owners who are tourists can now look forward to an early change in existing laws and regulations governing headlights and devices. Just as soon as the various state motor vehicle departments have adopted the new specification of the A. E. S. C., one of the tribulations of tourists will be removed. We are all aware of the seemingly hopeless task that confronts one who endeavors to meet the varying regulations of states and communities.

There has, of course, been an agreement as to lights between motor vehicle commissioners who form the Conference of Motor Vehicle Administrators, which represent ten Eastern states. Aside from the states in this conference, however, the motorist whose headlighting equipment has been examined, tested and approved by the authorities of one state has no assurance that his lights will be approved by any other state into which he may happen to drive. There has been little agreement among states as to methods of testing automobile headlamps or as to what constitutes a proper and what a "glaring" headlight.

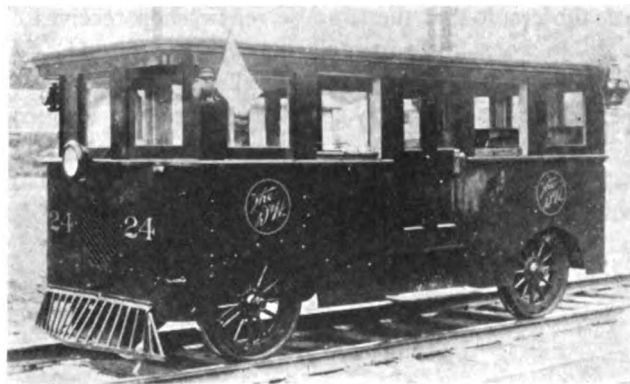
The approval of one set of specifications for such a test by the American Engineering Standards Committee, which is the national clearing house for standardization information and which provides the machinery for developing standards on a national scale, will place before the motor vehicle departments of all the states what represents the consensus of opinion concerning the most effective and most desirable method of testing automobile headlights. Even before these specifications had been formally approved by the A. E. S. C. nine of the states indicated that they would adopt the specifications; in three states they are already in effect.

These specifications were submitted to the A. E. S. C. by the Illuminating Engineering Society. This organization and the Society of Automotive Engineers have been appointed joint sponsors for any revision and further development of the code which may be necessary. Approval of the specifications was recommended to the American Engineering Standards Committee by a special committee which had been appointed to investigate their practicability and acceptability. This committee, of which David Van Schaack, vice president of the National Safety Council, was chairman, was made up of representatives of the automobile manufacturing industry, automobile accessory manufacturers, the officials of motor vehicle regulatory bodies, insurance companies, safety organizations, technical societies and of the United States Bureau of Standards.

Old Car Finds New Work

AFTER serving faithfully over many thousands of miles of highways and byways, a Buick chassis is now doing itself proud as an inspection car on the Delaware & Hudson Railroad.

Deprived of its rubber shoes and familiar hood, the chassis is said to be performing as competently over steel rails as when its course was less restricted.



J. E. Fairhead, Superintendent of the Pennsylvania Division of the D. & H. says that its riding qualities are still beyond criticism. "It will easily attain forty miles an hour with eight or ten passengers," he adds.

"What Next?" Asks the Public

Mystery demonstrations have become the vogue as competition in the automotive field grows keener. Press reports recently tell of cars that talk, that see, that obey the commands of persons not in them as though they were under a magic spell.

L. D. Reed, a driver of one of the now famous Mitchell "White Streaks," which are operating throughout the United States, is the inventor of one of the latest stunts which has been entertaining and puzzling the motoring public of Boston.

Reed drives his car into a crowded section of the city, throttles it down to a very slow speed in high gear, and then jumps out and runs ahead of it. This car follows him like a pet dog. While the populace is still gaping, he turns about, faces his car and commands it to stop, which it does with uncanny promptness. Reed then commands the car to follow him again and to the astonishment of everyone there is a whir of the starting motor and the car starts to crawl after him. The headlights blink on and off at a word. The klaxon sounds a warning automatically if anybody intrudes on the right of way. To all intents and appearances it is an automobile actuated by human intelligence.

Reed admits that his demonstration is trickery, but he refuses to reveal his method of operation and so far no one seems to have discovered his secret.

Motor Vehicle Monthly.

Repairs to Chains and Sprockets

CHAINS and sprockets of all types of automobiles and motor trucks are necessarily subjected to more wear and tear than many other parts of the mechanism. The result is that there is more or less repair work required. This is especially so on machines where the chains are exposed to the mud and grit commonly prevailing. The presence of foreign substances on the chains makes it difficult to properly lubricate the parts with the result that the average repair shop receives considerable work to do in replacing worn parts and adjusting strained and worn gears and chains. Then again we receive chains and sprockets in the shop that need overhauling because of lack of lubrication and the effects of rust. The accompanying drawings are given to illustrate some of the common cases of wear and tear on sprockets and chains with instructions for correction. Figure 1 shows a sprocket with the cogs worn different ways. An

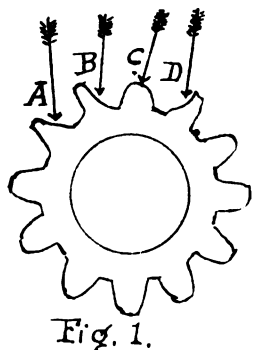


Fig. 1.

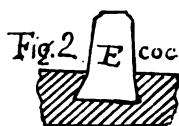


Fig. 2

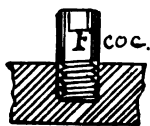


Fig. 3.

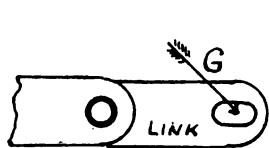


Fig. 4.

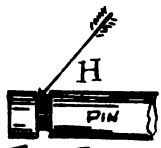


Fig. 5

autoist may arrive at the repair shop with the chain starting to wind around the sprocket. It will be found that the points of the cogs of the sprocket are worn into hook formation as at D. The hook clings to the links of the chain and of course there is a tendency to drag the chain around the sprocket. Or the cog may be worn into the shape indicated at A, B, or C. Frequently an attempt is made to make the sprocket last longer by filing off the hooks of the cogs or inserting new cogs. It is far better to substitute the worn sprocket with a new one.

But if a new sprocket is not available, and if the sprocket has only one or two badly worn or fractured cogs, a new cog can be made by filing a piece of steel to the shape of the cog, and providing it with a base to fit tightly in a mortise filed in the rim of the sprocket as at E figure 2. I have seen cases in which a new cog has been installed by drilling a hole in the place formerly occupied by the broken cog and inserting a threaded pin as at F figure 3. This pin is then filed to the shape of a cog.

There are, of course, four wearing surfaces in the average type of chain drive. Two of these wearing surfaces are between the pin and link and two between the pin and block. In figure 4 we show how chain links will wear in some cases after long use. The hole becomes elongated as at G and this results in a lengthening of the chain. Or the pin may be worn at the bearing H figure 5. If the links or the pins are very badly worn,

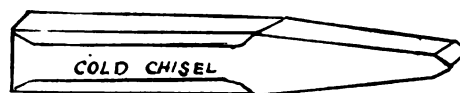
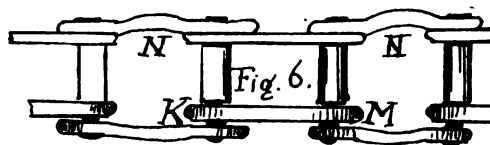


Fig. 7

the only practical remedy will be the exchange of the old chain for a new one. But if the chain is worn but little, and has stretched so that it does not correctly perform its mission, the shortening operation may be used with beneficial results. I have seen men try to shorten the chain by pounding on the links with the intention of bending them. The bend will, of course, make each link a little shorter and the desired result may be obtained. But often in seeking this end the entire chain will be damaged. In figure 6 we show at K and M how a chain was damaged by loosening and opening of the connections as a result of poor work.

This resulted in a weakened and defective chain although it was somewhat shortened by the process. A better way to shorten a chain is to use a cold chisel of the pattern shown in figure 7. Then place the chain on an anvil or block of iron in which there is a hole large enough to admit the point of the cold chisel. Then place the chain over the hole and insert the point of the cold chisel and drive the chisel with a hammer down between the chain links until the links are expanded on each side

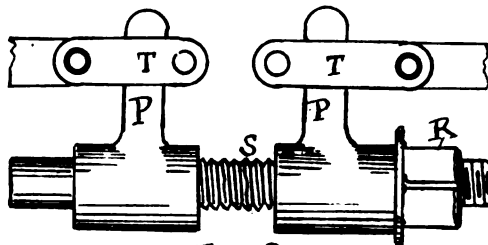


Fig. 8

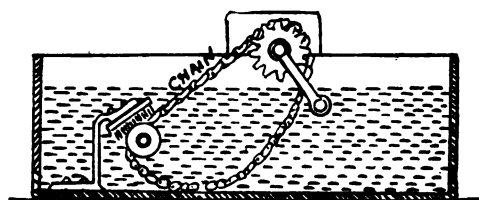


Fig. 9.

as at N, N, figure 6. This process repeated on all or

part of the links will sufficiently shorten the chain to make it drive right.

Chain Connecting Device

Considerable bother in connecting chains is experienced when an effort is made to get the two ends joined without the use of a device for stretching the same. A shop-made device for this purpose is shown in figure 8. You first get the castings P.P. or if desired these parts can be made of wrought iron at the forge. Then bore through the shoulder pieces and cut a thread in one. The shaft S is then made and cut with a thread to correspond with the thread in the piece already threaded. Then in order to make it possible to bring the ends of the chain together, the links T,T, are hooked over the projections P.P. as shown. The shaft S is furnished with the nut R so that when this nut is turned, it forces the smooth bore hook P along and carries the chain T with it towards the chain link opposite. The hook piece on which the latter chain link rests is fast on the shaft as it is held there by its thread on the thread of the shaft.

Cleaning Chains

Figure 9 is a homemade affair used to good advantage in cleaning chains. It consists of a sheet metal tank about three feet long, two feet wide and 18 inches deep, fitted with the sprocket which is turned on a shaft resting in bearings on the box and provided with a crank for turning the same. There is a stiff bristle brush fitted to a metal stand just over the lower roller in the box as shown. The tank is filled with gasoline about two-thirds from the bottom and the chain is dragged through repeatedly until cleaned by simply turning the sprocket by means of the crank. Lye can be used for this purpose, instead of gasoline, if desired. The cleaning is usually accomplished in five or ten minutes, after which the chain should be wiped, dried and oiled.

Efficiency of Friction Drive

BY N. G. NEAR

NO drive has yet attained an efficiency of 100 percent and the writer feels that he is safe in predicting that no such efficiency will ever be attained. Friction must always be contended with and in the friction drive there is known to be some slip or "creep."

The efficiency of the ordinary friction drive can be computed with considerable accuracy by counting the number of revolutions the driven wheel actually makes and subtracting it from the number of revolutions the wheel "should" make, the latter to be based upon theoretical considerations assuming that there is no slip whatever.

Then divide the difference by the number of revolutions the wheel "should" make and the answer is the amount of slip.

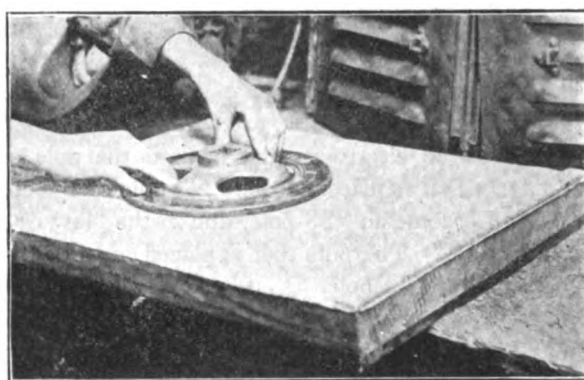
For example, if the wheel actually makes 95 revolutions per minute whereas it "should" make 100 revolutions per

minute the difference is 5 revolutions per minute. Divide this 5 by 100 and we get .05. In other words the slip is 5 per cent.

Then, to obtain the efficiency of the friction drive, subtract the percentage of slip from 100 and the result is the efficiency. In the above example we would have $100 - 5 = 95$ per cent efficiency.

Surfacing Plate for Grinding Flat Surfaces

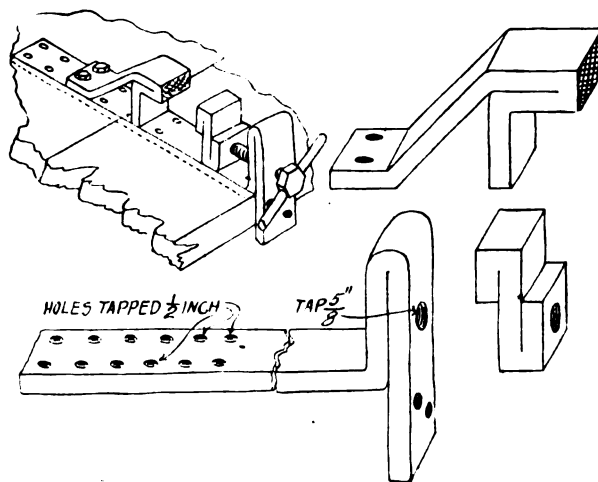
The accompanying photograph shows a handy surfacing plate for grinding flat surfaces, such as friction clutch disks. It consists of a heavy sand-paper 18 inches square on a heavy board, held tight by two end plates.



In grinding a flat surface the operator simply moves the object over the face of the sand-paper.

Wide Opening Bench Vise

The shop mechanic can very easily provide himself with a durable wide range bench vise that will hold cylinder heads and other large work with very little outlay of time or money. The material can be of miscellaneous scrap. The writer made such a vise from $3/8 \times 2$ iron.



Anyone handy at bending at the forge can devise this tool and it will take wider work than any vise possible to purchase on the market.

Remagnetizing Ford Magnetos

CAREFUL DIRECTIONS AS TO HOW IT MAY BE DONE
WITHOUT REMOVING THEM

THE magnets of a Ford magneto will tend to get weak in the course of time, just as the magnets of any other magneto will. The usual method of remedying this trouble is to remove the magnets and either trade them in and get new ones or remagnetize them in the same manner as other magnets are remagnetized. This, however, necessitates the tearing down of the engine and then reassembling it after the magnets are brought up to their proper strength. This makes a costly job because it is a big job. The writer assumes that the reader knows how to remagnetize ordinary magnets, but for the benefit of those who do not know, it is well to mention a few of the most important points.

First—It is necessary to have some sort of electro-magnet or solenoid.

Second—If an electro-magnet is used the pole of the weak magnet that is placed on the "N" pole of the electro-magnet will become an "S" pole, due to the "law of magnetic induction." The pole that is placed on the "S" pole will become an "N" pole.

Third—It is always best to magnetize a magnet so that the magnet poles are where they originally were, rather than try to reverse them.

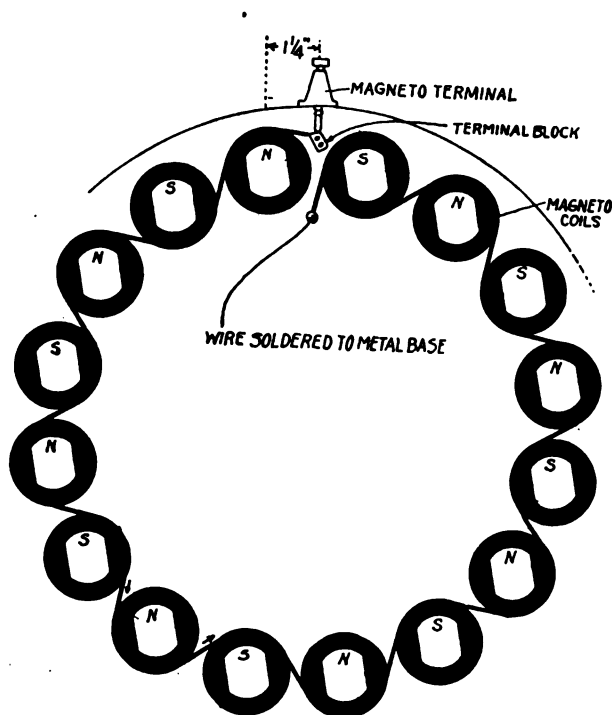


Fig. 1.

Fourth—The end of the compass needle that points toward the north is called the "north seeking" or "N" pole, while the end that points south is called the "south seeking" or "S" pole.

Fifth—The "N" pole of the compass will point toward

the "S" pole of any other magnet, while the "S" pole of the compass will point toward the "N" pole of any other magnet. This is in compliance with the "law of magnetic attraction and repulsion," which says that "magnetic poles of like sign repel each other, while magnetic poles of unlike sign attract each other."

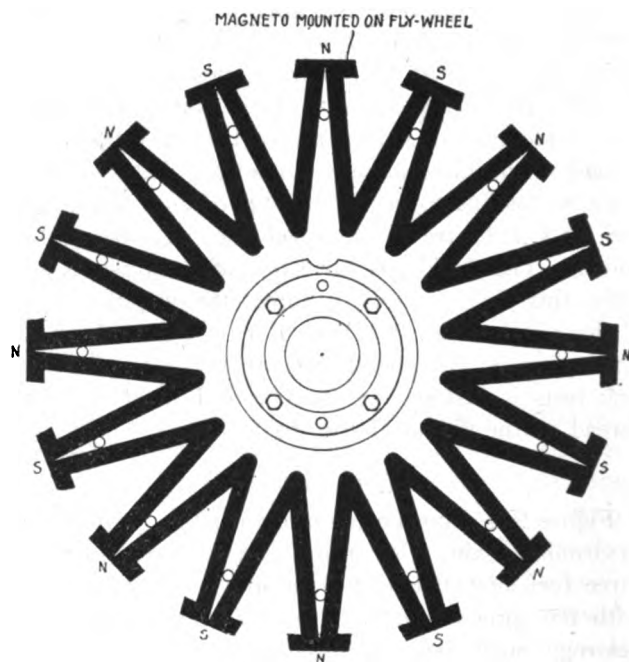


Fig. 2.

Although it is assumed that you are familiar with the construction of the Ford magneto, a brief description may not be amiss here.

This magneto is of special construction. The magnets (of which there are sixteen) are mounted on the flywheel—bolted to the front face of the flywheel and arranged as shown diagrammatically in Fig. 2. These magnets are U-shaped and arranged so that the poles of like sign are adjacent to each other. The "N" pole of one is right beside the "N" pole of the next, and so on; therefore, this forms a 16-pole field. They are clamped to brass instead of being bolted directly to the flywheel. This tends to reduce magnetism in the flywheel.

Slightly in front of the flywheel is a ring of non-magnetic material, upon which is mounted sixteen electromagnetic coils. These coils are each made of a ribbon of insulated copper wound round an iron core. These coils are all connected in series with each other, and adjacent coils are wound in opposite directions, as indicated by the arrows in Fig. 1. One end of the first coil is connected to the terminal block shown in Fig. 1. The other end of this coil is connected to one end of the next coil to the left, then the other end of this coil is connected to the next, etc., until the last one is reached. The final end of this one is soldered to the base or ring on which the coils are mounted. There is an insulated terminal on top of the magneto case which makes electrical contact with the terminal block by means of a spring. This terminal leads off the current that is generated by the magneto.

GOOD EQUIPMENT ATTRACTS THE BEST TRADE

Knowing all this, it is easy to perceive that if the positive wire from a battery were connected to the terminal on top of the magneto case, and the negative wire were grounded, current would flow round the first coil to the left of the terminal in a counter-clockwise direction, and round the next coil in a clockwise direction, etc. This would cause the first coil to present an "N" pole toward the permanent magnet that happens to be squarely back of it. The next coil will present an "S" pole, etc.

Thus you can see that you would have all the conditions

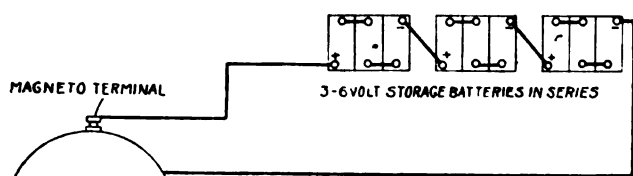


Fig. 3.

necessary to remagnetize the permanent magnets if you had the poles of these magnets squarely back of the cores of the electro-magnets. So the problem of remagnetizing the magnets lies simply in getting the magnets properly placed and sending sufficient current through the coil to produce saturation of the magnets.

To properly place the magnets, proceed as follows: Remove the floor board and toe boards. Have the car facing east or west. Now measure a point about $1\frac{1}{4}$ inches to the left from the center of the terminal. (This means toward the left-hand side of the car.) Mark this point. Place a compass squarely back of this point and just about three or four inches back of the top of the magneto case. Now turn the engine over very slowly until the "N" pole of the compass points toward your mark.

You now have the magnets properly arranged. The "S" pole of one of your magnets is squarely back of the first coil. Each magnet pole is back of a coil. It is now simply necessary to energize the coils, which you do as follows: Remove the wire from the terminal. Secure three or four 6-volt storage batteries and connect them in series. This will give you 18 or 24 volts. Connect the positive wire to the terminal, then touch the negative wire to the engine frame or any metal part of the car.

rent, you must have at least 48 of them and connect them in series-multiple—16 cells in series. This will give three files of cells of 16 cells to the file. Connect the three files in parallel. This will give about 24 volts, and if the cells are in good condition they will furnish enough current to do the job. If you have a 32-volt generator, connect it directly to the magneto without any resistance in the circuit. Place the positive wire on the terminal and ground the negative wire as described above.

To use 110-volt direct current it will be necessary to

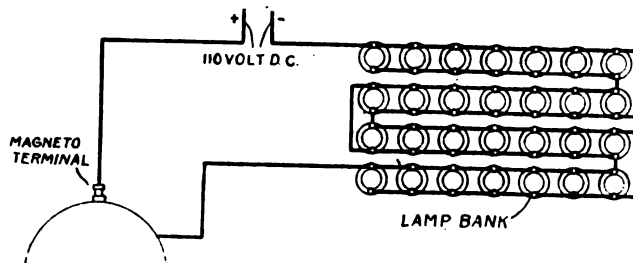


Fig. 5.

use resistance or a lamp bank. If you use a lamp bank, use twenty-five or thirty 32-candle-power carbon lamps. If you use resistance, make or secure a 3-ohm coil of sufficient current capacity. Place this coil in series with the magneto. A resistance coil for this purpose may be made of about 13 feet of No. 16 nichrome resistance wire or 8 feet of No. 18. If you wish to use 18 per cent. German silver wire, it will require about 35 feet of No. 16, or about 22 feet of No. 18. Fig. No. 3 shows how the three storage batteries should be connected to the magneto. Fig. No. 4 shows how 48 dry cells may be connected to give good results. Fig. No. 5 shows a lamp

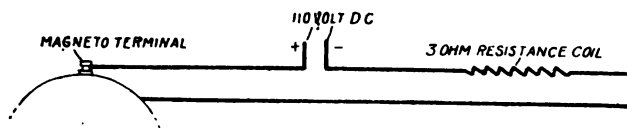


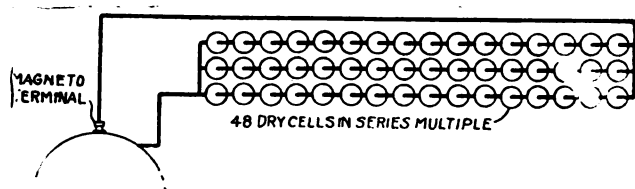
Fig. 6.

bank of 28 lamps properly connected to 110 volt direct current circuit. Figure No. 6 shows how a 3-ohm resistance coil should be connected to the same kind of circuit.

Crosses Continent in 180 Pound Machine

"Cannonball Baker" driving a Neracar—New York to Los Angeles—with a 13.5 cu. in. motor, completed his sixtieth transcontinental trip Sunday, Nov. 19th at 2:12 p. m.

Baker's total mileage was 3364.2 miles, using 45 gallons of gasoline and 44.75 pints of oil, at a total fuel cost of \$15.70. His running time was 7 days, 6 hrs. 1 min., or an average of 19.3 miles per hour, and 74.76 miles per gallon of gasoline. This is the smallest machine to ever make this trip under its own power. Total weight of machine, equipment and rider 420 lbs., machine alone 180 lbs.



To properly energize the coils will require from 24 to 30 amperes. More current will do no harm unless the connection is maintained too long, in which event the coils would get hot, which would probably injure the insulation. Make and break your ground connection five or six times. This will give five or six "shots" of 24 to 30 amperes, which will be sufficient to do a good job.

If you have nothing but dry cells for a source of cur-

Automobile Dealer and Repairer

A Mechanical Motor Magazine

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M. T. RICHARDSON
President and Treasurer

F. R. WHITTEN
Secretary

M. T. RICHARDSON, Editor
GEORGE H. WILSON, Managing Editor

F. R. WHITTEN, Advertising Manager
M. F. LUDINGTON, Western Representative
GEORGE A. SMITH, Eastern Representative
FRANKLIN MYERS, Art and Copy Manager

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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

All communications should be addressed to the New York City office at 16 Hudson St.

Equipment Service and Profits

The car owner with a mechanical knowledge sufficient to enable him to make all necessary repairs and adjustments on his car is a rare exception. He would be difficult to locate and when located would likely prove to be such a busy man that he couldn't, if he would, take the required time to do the work often found necessary, in order to keep his automobile in first class running order. This very fact is the real reason for Service Garages and Repair Shops. The majority of the ten million or more car owners depend entirely on the garage or service station, or repair shop for the most of the important work necessary to be done. Because car owners are coming to realize that a car is not only as good as it is built, but as good as it is kept, they are fast learning to be careful, and particular, as to where they take their work to be done.

Today the wide awake automobile mechanic, be he proprietor or employee, is aware that something besides knowledge is necessary to success. He recognizes the fact that in addition to mechanical skill the equipment of the shop with adequate tools and machines is as essential, if repair work is to be done well and at a profit.

The need of good shop equipment is obvious. It has come to be the first requisite of good shop practice. Because the automobile is such a vital factor in transportation today, and so many people are dependent on it

for economic well-being, efficient maintenance has become an absolute essential.

There can be no question as to the profits to be derived from the operation of a garage, repair shop, or service station, where a well chosen equipment is in operation coupled with mechanical knowledge and skill. It is in such shops that Real Service is to be obtained, with maximum profit to the shop and enduring satisfaction to the shops' patrons. Such are the shops enjoying prosperity.

The Workshop Experience Prize Contest

During the past few weeks the entries in our Workshop Experience Prize Contest have been coming in so fast that we are faced with an extraordinary amount of work in properly classifying and rating all of the manuscripts received. This contest closed on the fifteenth of the month, and according to our promise we will award prizes on the opening of the New York Automobile Show, or to be explicit, on January sixth.

We have been greatly pleased to receive the many interesting and instructive articles that have been contributed to this contest by our readers. A number of them will be found in this issue and still more will be published in the January number. It would be an impossible task to undertake writing all contests and for this reason we have decided to announce the various prize winners in our January issue.

An Interesting Side Show

During the time of the New York Automobile Show, a group of wholesalers and members of the Automotive Equipment Association will hold a dealer's meeting, to which are invited not only local dealers in accessories, but garage and repairmen from out of town, who may be here attending the Auto Show. The meetings are tentatively scheduled for January 10th, and is hoped that they will prove to be the greatest gathering of the kind in the history of the business. There will be a showing of the A. E. A. film—"Ask 'em to Buy," accompanied by a merchandising talk from Ray Sherman. Mr. Sherman will also give a very interesting talk in connection with the showing of the film entitled "Shop Profits." If you come to New York for the big show, don't forget to take in this important side-show.

Our Trouble Department

Owing to the frequent requests for wiring diagrams, and also to the large number of questions sent our Trouble Editor, we will hereafter be obliged to omit the publication of such diagrams in our Trouble Department pages. Readers will receive wiring diagrams by mail upon request, thus allowing more room for the publication of general information of interest and value to a larger number of subscribers.

Service Equipment Associates New Trade Body Organized

A NEW trade body, Service Equipment Associates, consisting at present of eighteen leading manufacturers of automotive shop equipment was organized at a meeting held in Chicago, November 17th.

The objects of this body are limited to cooperative promotional and educational efforts designed to broaden the market for good service equipment by means of advertising and to simplify by means of standardization the work of the individual members wherever practicable.

Membership is by invitation only, as it is intended that this group shall be looked upon eventually as representing dependable products only.

This organization is an outcome of the Cooperative Shop Equipment Manufacturers Advertising Campaign which has been running in the trade papers since June, 1922, which was originated and details handled by the advertising manager of one of the members.

The Cooperative Advertising Campaign having demonstrated its value, a meeting at which fifteen of the original participants were represented was held on November 10th at the Congress Hotel, Chicago, at which time a committee appointed at a previous meeting recommended a plan of organization which was unanimously accepted.

The plan, briefly, provides for a very simple organization of the round table type, with an Executive Commission consisting of three members to be chosen by election, one new commissioner to be elected each year, so as to have two experienced commissioners carrying over each year. Meetings were planned for four times a year, one during each of the Automotive Equipment Association conventions, and the other two meetings midway between.

Wm. Webster, Commissioner, Automotive Equipment Association, and Ray Sherman, Merchandising Director, Automotive Equipment Association, made short talks, offering helpful suggestions and cooperation.

The following officers were elected:

Executive Commission

G. W. Brogan, The Black & Decker Mfg. Co.
Term three years
S. V. Wood, Mid-West Manufacturing Co.
Term two years
Chas. F. Hodgson, Weaver Mfg. Co.
Term one year

Steward

Frank Chase, Frank Mossberg Co.

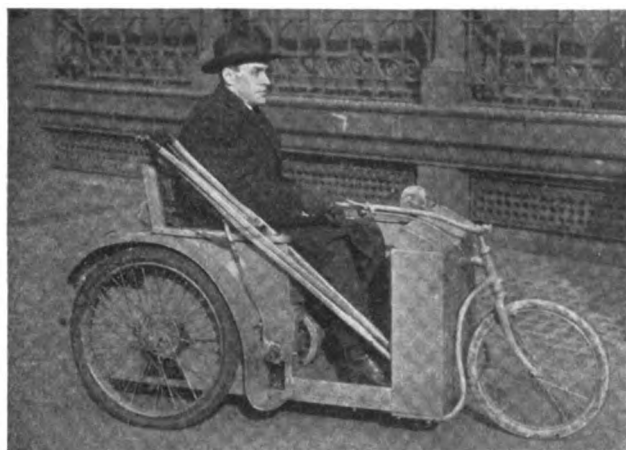
The member firms, three of which were elected to membership at the time of organization, are as follows:

T. R. Almond Mfg. Co.
Amer. Bureau of Engineering
Black & Decker Mfg. Co.
Burton-Rogers Co.
Continental Auto Parts Co.
Greenfield Tap & Die Corp.
Jacobs Mfg. Co.
Manley Mfg. Co.
Micro Machine Co.

Mid-West Mfg. Co.
Frank Mossberg Co.
Oxweld Acetylene Co.
Weaver Mfg. Co.
Joseph Weidenhoff
Wright Mfg. Co.
Bonney Forge & Tool Works
Stevens & Company
Kellogg Mfg. Co.

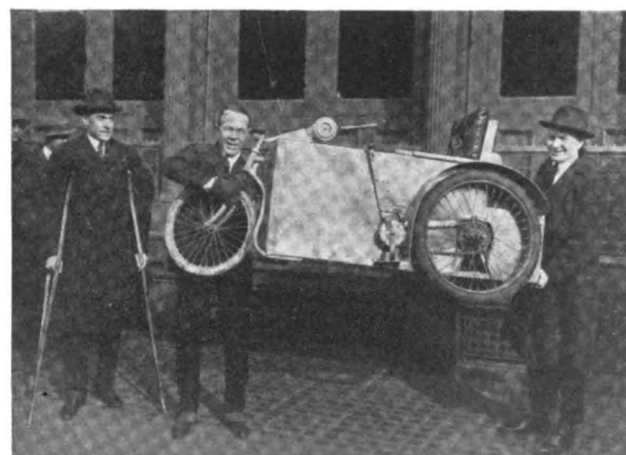
Cripple Invents Unique Automobile for Legless Drivers

HIMSELF a cripple from infantile paralysis, contracted while serving in the Mexican Border Campaign, and unable to get about as necessary in his occupation as a mining engineer, Arthur M. Van Rensselaer, of New York, has invented the novel little automobile shown in the accompanying pictures. The machine is a motor propelled three-wheeled vehicle, thirty-two inches wide and seventy-six inches long. It is operated entirely by hand control. The self starter, which may be seen in one of the photographs is operated by the right



arm. The speed of the car can be regulated from three to fifteen miles per hour. The car has been tried out on all the hills around New York and has been driven on Broadway and Fifth Avenue. Ease in getting in and out of the car and a special dashboard for weather protection are prominent features which adapt this machine to the use of cripples.

"Unless one has actually experienced disability and knows how desperate it is to feel himself a burden to



those about him," said Mr. Van Rensselaer when speaking of his invention, "he cannot really appreciate the extreme odds the badly crippled are up against." The lightness of the machine is demonstrated in one of the illustrations, two men easily lifting it high.



This department is intended as a "Trouble Clearing House" for our readers. Correspondents are requested to give the fullest information in every case, so that replies may be made intelligently and be of value to others, as well.

All letters will be answered as promptly as possible, but we would remind our readers that some of the information asked for by correspondents is not always "on tap" and if time is required in securing the desired facts a reasonable delay in answers must be expected.

Readers are requested to make criticism and comment or to freely discuss any subject of interest to the automobile mechanic, owner or operator. This is your own department and you can make it just as interesting and valuable as you will.

Wiring diagrams will no longer be printed, but will be furnished by mail when requested.

3165

From B. & B. Auto Radiator Co., Pa;—Please print in your next issue a complete wiring diagram of a 1921 Handley-Knight Model A. Also some information in regard to kinds of wire to be used in wiring a car.

Reply: The diagram requested is printed on this page.

Primary wires should be flexible, stranded wire, covered with a waterproof insulation. This is also used for lighting circuits. Flexible steel-armored wire is extensively used for automobile work. Secondary cable is used for high-tension ignition current from coil to distributor and from distributor to spark plugs. The wire is small but the insulation is heavy, as it carries a high voltage but a low amperage.

The starting-motor wire must be very large because it carries a very heavy current. No. 0 is generally used on small and medium sized cars and No. 1 or 2 or 00 is used if the distance is greater as might be the case on a larger car. No. 00 measures .36" diameter over the copper strands, and being made up of many strands covered with rubber and with a braided cover over the rubber. Wires running from the generator to the storage battery are much smaller. The carrying capacities of various sizes of copper wire are given as follows:

No. 18	B & S gauge.....	3 amperes.
No. 16	B & S gauge.....	6 amperes.
No. 14	B & S gauge.....	15 amperes.
No. 12	B & S gauge.....	20 amperes.
No. 10	B & S gauge.....	25 amperes.
No. 8	B & S gauge.....	35 amperes.
No. 6	B & S gauge.....	50 amperes.
No. 4	B & S gauge.....	70 amperes.
No. 3	B & S gauge.....	80 amperes.
No. 2	B & S gauge.....	90 amperes.
No. 1	B & S gauge.....	100 amperes.
Nos. 1 & 0	B & S gauge.....	125 amperes.
Nos. 2 & 0	B & S gauge.....	150 amperes.

ELECTRIC HORN POWER

From F. R. S., West Virginia.—Can I connect my

Sampson electric horn to the Bosch high tension magneto?

Reply: We would not recommend you to do this. But if you can devise a way to make the connections the magneto would probably answer the purpose for a time. It should be borne in mind that the magneto was not designed for such use.

3166

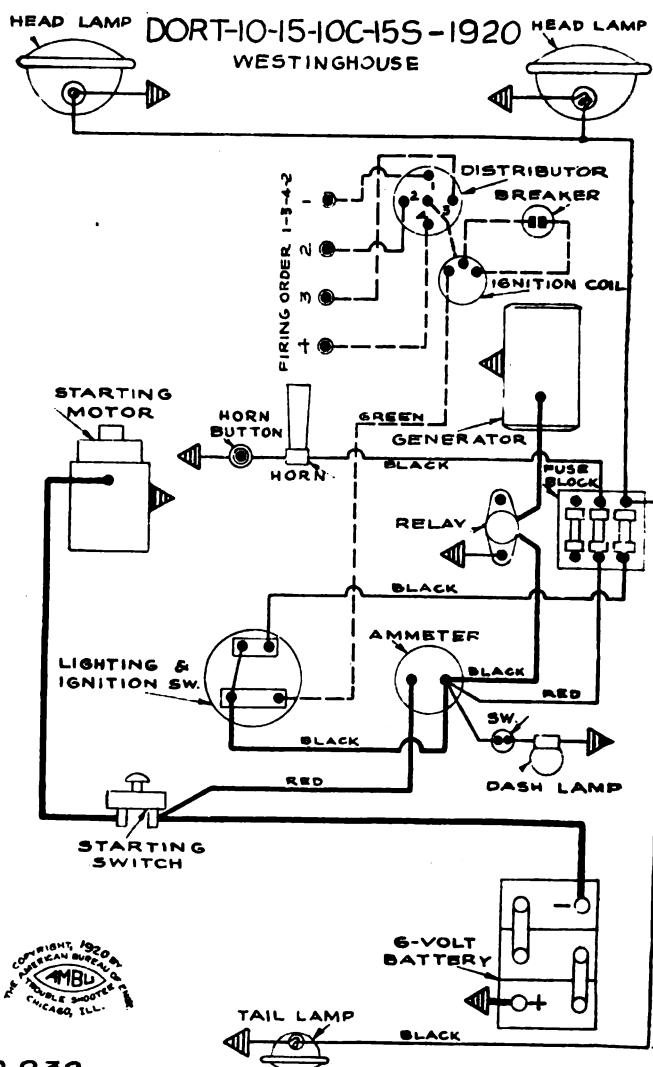
From E. C. Edwards, Ill:—When using a magneto and battery for ignition, how is it that my engine continues to run after I turn off the switch?

Reply: The ground wire from magneto is probably broken. With magneto ignition the switch closes or short circuits the primary winding thru this ground wire. If the wire is broken the current could not be short circuited and the engine would continue to run.

3167

From G. S. Best, Mich.:—Please publish the wiring diagram of the Dort, 1920 Touring car, model 15.

Reply: The diagram requested is printed below.



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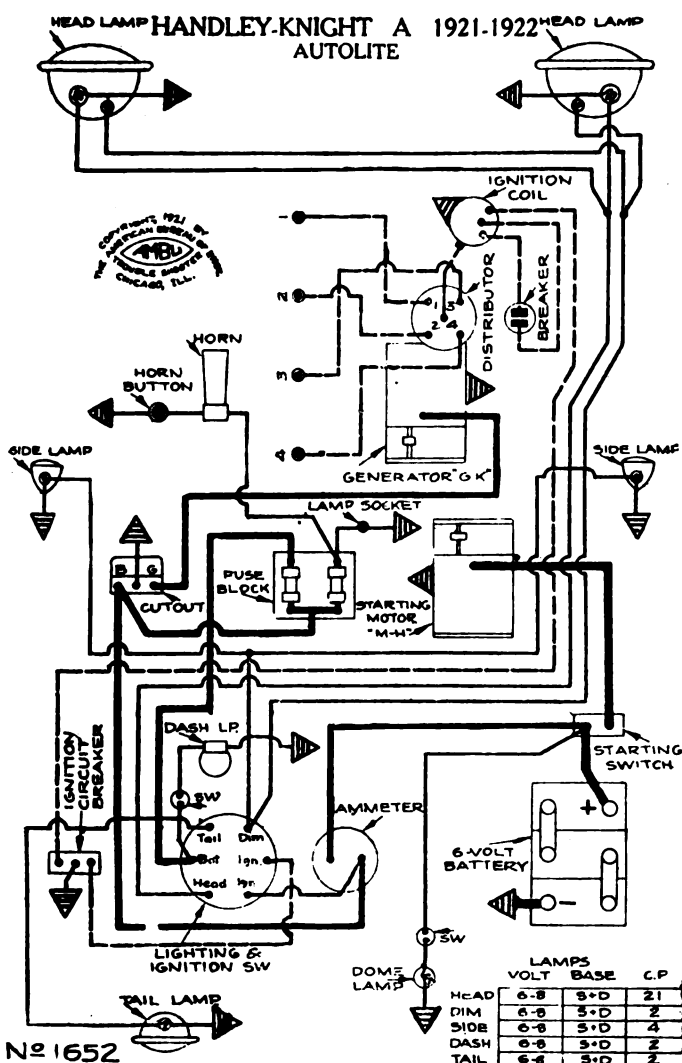
No 839

OIL LEAK IN OAKLAND 1919

3160

From R. A. Pearson, Alabama: Please tell me how to stop my Oakland Car, 1919 model, or Model No. 34, from leaking oil through the fly wheel, or the shaft that runs through the fly-wheel and into the transmission.

Reply: The spline shaft in the Oakland 1919 transmission, which carries the sliding gear, is drilled with three holes about a quarter inch in diameter. These holes are plugged with felts, through which the oil from the hollow center of the shaft works through and lubricates the outside of the shaft. After these felts have become saturated with oil they sometimes shrink and drop out of the holes. If you will simply drop the transmission you will see these holes, and if the felts are out they may be replaced easily with new pieces cut from felt of a suitable thickness.



No 1652

3155

From C. N. Wheeler, Ohio: Last winter I had some trouble as a result of my carburetor freezing up. What is the cause of this?

Reply: Probably an excess amount of water in the gasoline you were using. If the car is kept in a cold garage over night such trouble would be the result.



Wisdomites

If speedometer points vibrate, look for sharp bends in flexible shaft, loose unions, gears not in mesh properly, poor lubrication.

* * * *

An S. A. E. bolt and an S. A. E. cap screw differ only in the amount of thread cut on it. Size and shape of head is the same and threads per inch the same.

* * * *

The diameter of a bolt or screw is measured just below the head, where the metal is full diameter. Measured on the threads the diameter will be found to be slightly less.

* * * *

Taper pins require taper reamers and reamers must always match the pins.

* * * *

Cast iron pistons require about one-half the clearance of those made of aluminum alloy, because their expansion is considerably less under the same degree of heat.

* * * *

Flake graphite mixed with cylinder oil will, if properly used improve compression and less oil will be required. It will also tend to fill up scores in cylinder walls and help to prevent valves and rings sticking.

* * * *

Chips of metal, or a nut, if allowed to remain in transmission case will, if caught in gear teeth, strip the gears. This is also likely to happen in engine or differential.

* * * *

When hardening carbon steel bring to a cherry red heat, then plunge into cold water and hold until hissing ceases, then remove and place in oil for complete cooling.

* * * *

Heavy wrapping paper, well shellacked can be used for gaskets in many places, such as gear box cover, etc.

* * * *

Abnormal compression is very likely to cause overheating.

* * * *

Dragging brakes will consume a lot of power. Be careful to have all brakes properly adjusted before starting a trip.

* * * *

Kerosene mixed with lubricating oil will render it useless as a lubricator.

* * * *

Modern, wide-awake repair shop men use a sprayer for cleaning engine and other parts of cars. A gasoline or kerosene sprayer is a useful time saver.

* * * *

Portable electric drills are handy for drilling holes in frames for shock absorbers, horns, mufflers, etc., etc., as well as for general machine shop work.

Show Calendar

- PHILADELPHIA, Pa.**—Passenger Car Show, auspices of the Philadelphia Automobile Trade Assn., Commercial Museum, Louis C. Block, manager; January.
- NEW YORK, N. Y.**—National Automobile Show, auspices of the National Automobile Chamber of Commerce, Grand Central Palace; Jan. 6-13.
- NEW YORK, N. Y.**—Second National Automobile Body Builders' Show, auspices of the Automobile Body Builders' Assn., 12 Regiment Armory; Jan. 8-13.
- CLEVELAND, Ohio.**—Annual Winter Show, auspices of the Cleveland Automobile Manufacturers' and Dealers' Assn.; Jan. 20-27.
- CHICAGO, Ill.**—National Automobile Show, auspices of the National Automobile Chamber of Commerce, Coliseum; Jan. 27-Feb. 3.
- CHICAGO, Ill.**—Annual Automobile Salon, auspices of the National Automobile Chamber of Commerce, Drake Hotel; Jan. 27-Feb. 3.
- HARTFORD, Conn.**—Automobile Show, auspices of the Hartford Automobile Dealers' Assn., State Armory, Arthur Fifott, manager; February.
- MINNEAPOLIS, Minn.**—Annual Automobile Show, auspices of the Minneapolis Automobile Trade Assn., W. R. Wilmot, manager; Feb. 3-10.
- NEW YORK, N. Y.**—Annual Automobile Show, auspices of the Brooklyn Motor Vehicle Dealers' Assn., 23 Regiment Armory; Feb. 24-Mar. 3.
- SYRACUSE, N. Y.**—Annual Automobile Show, auspices of the Syracuse Automobile Dealers' Assn.; Feb. 26-Mar. 3.
- NEWARK, N. J.**—Annual Automobile Show, auspices of the Newark Auto Trade Assn., Claude E. Holgate, manager; Mar. 10-17.
- BOSTON, Mass.**—Passenger Car, Truck and Accessory Show, auspices of the Boston Automobile Dealers' Assn., Mechanics Building, Chester I. Campbell, manager; Mar. 10-17.
- ATLANTA, Ga.**—3rd Annual Great Southern Automobile Show, City Auditorium. Passenger cars and accessories. V. W. Shepard, Mgr., 22 Edgewood Ave.; February 17-24.
- PORTLAND, Ore.**—14th Annual Show of Automobile Dealers' Association of Portland. Municipal Auditorium. Passenger cars, trucks, tractors and accessories. Ralph J. Staehli, 424 Henry Building; Feb. 12-19.
- WINNIPEG, Man.**—Third Annual Automotive Equipment Show. Radio exhibits in connection. Under the auspices of the Western Canada Automotive Equipment Association. W. L. Williams, Secretary, Box 3164, Winnipeg.; Feb. 5-10.
- MONTREAL, Canada.**—1923 Montreal Motor Show, under auspices of Montreal Automobile Trade Association, Almy's Building, Montreal, Jan. 20 to 27. Adelstan Levesque, Mgr., 115 Stanley St., Montreal.

Eastern Jobbers of A. E. A. to Have Big Meeting

VAUDEVILLE, music, prize drawings and the showing of the great automotive films, "Ask 'em to Buy" and "Shop Profits", are part of a huge program for dealers, garage and repair men, January 10th, which is during the New York Automobile Show. The show will be at Carnegie Hall and will be under the auspices of the Metropolitan jobber members of the Automotive Equipment Association, which organization made the two highly helpful business films mentioned.

Ray Sherman, merchandising director of the A. E. A. is scheduled to deliver one of the entertaining business talks for which he is famous and there will be present other automotive experts, similarly worth hearing.

The meeting, which is scheduled for 1:45 in the afternoon, will be free to all men in the retail field of motor-dom, whether in repair or dealer branches, and tickets may be obtained by these men either through their own jobbers, or, should they visit the New York show from points outside of the Metropolitan district, they can get tickets from Mr. Robert L. Sim of the Whittemore Sim Company, 346 West 65th Street, New York. Mr. Sim is Chairman of the Committee of Management.

The entertainment will include several vaudeville headliners and the music will be by a famous orchestra.

Prizes, of which there will be many, will be drawn for at the conclusion of the meeting, and a completely equipped automobile will be numbered among them.

From every view, this special dealer show will be record breaking not alone in point of large attendance but in the varied nature of a program which will in every respect be entertaining. The Committee in preparing the plan, adopted for its slogan "It Must be Interesting" and whether in sheer amusement phase or in the business part of the program, every minute of the show will measure to that promise.

Readers of this journal who attend the National Show at Grand Central Palace may profit by the opportunity offered to attend the exhibit and lectures at this meeting.

Auto Body Builders Show

WHAT is to be the most noticeable trend in automobiles for the 1923 season?" is a question that has been asked of numerous automobile experts and manufacturers. The majority of replies were to the effect that more attention to bodies, especially closed models, will be the rule. This applies to the low and medium priced cars with stock bodies, many of which are being turned out in "special" designs and colorings. As for the more expensive cars, special and custom made body jobs are more in demand than ever before.

Many unique designs in bodies and their trimmings and accessories will be displayed at the Automobile Body Builders Show in the 12th Regiment Armory, 62nd Street and Columbus Avenue, New York, January 6th to 13th.

This exhibit takes place the same week as the National Automobile Show.

Whereas the buyer of a car in the past was chiefly concerned with the power plan and how it would perform and endure, he now takes the ability of the motor and quality of chassis for granted and thinks about the car's good appearance. It is expected that thousands of prospective buyers of cars, many of whom will place orders at the National Show, will attend the Body Show to make a selection of body type.

A comprehensive display of commercial bodies also will be offered.

Novel Clock Indicates Daily State of Business

Included among twenty-five forms presented in a treatise on budgeting as a means of business control, issued by the Fabricated Production Department of the Chamber of Commerce of the United States, is a novel clock arrangement by which the small manufacturer can tell at a glance the daily state of his business.

Clocks, or dials, are devised for each of the principal activities of the business. Each clock has two hands, a red one, pointed at the budget allowance, which remains stationary for the entire month, and a black hand, which is daily set at the amount of money spent by each department. The dials can be arranged so that they can be conveniently contained in a flat box 2" deep 24" wide and 50" long, designed for hanging on the wall.

The idea was conceived and put into operation by a manufacturer of optical goods, who found that his organization could be conveniently divided into the following five groups: Material, Factory, Administration, Sales and Advertising. The five executives at the head of these departments are placed into a business of their own and are told what the results of their next month's activities should be, together with the amount of money they may spend to produce these results. The Sales Manager is told how much in orders he is expected to get to keep the factory running; the Factory Superintendent, how much goods he must get out and how much accounts receivable he must create to provide the funds necessary in the following month; the Purchasing Agent, how much material is necessary to keep a well balanced inventory and to take care of the plans of the Sales Department; the Advertising Department and Administration, how much money they may spend in carrying out these plans.

The optical manufacturer describes his experience with this budget as follows:

"I secure a fairly complete picture—almost a daily profit and loss statement of my business. This arrangement has the bigger advantage of giving me a picture in place of figures. It warns me much faster than my monthly operating statement of danger ahead, or irregularities in our business, and violent fluctuations. We set our clocks once a day, about 11.30 a. m., for the prior day. This helps in keeping everybody interested—on

their toes. We give our Budget its share of the credit for having made a profit in 1921."

A copy of the pamphlet "Budgeting for Business Control" may be secured by writing direct to the Fabricated Production Department, Chamber of Commerce of the United States, Washington.

Abnormal Wear of Valve Seats Caused by High Temperatures

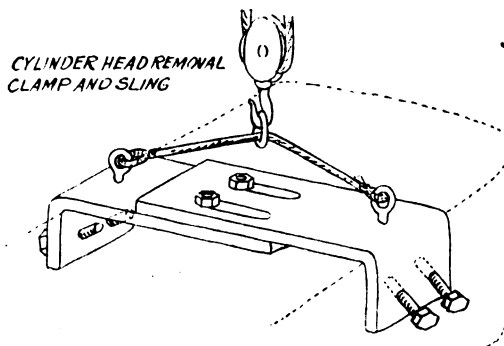
UNLESS gasoline engines are so designed that the heat generated by slow burning mixtures or pre-ignition is rapidly dissipated, the exhaust valve seats may reach such temperatures as to cause excessive wear of these parts.

The Bureau of Standards of the Department of Commerce has recently conducted an investigation to determine the cause of excessive wear of exhaust valve seats of certain engines. This condition only occurred in engines of a certain type and all engines of this type were not affected nor was the wear of all the exhaust valves of a single engine the same.

After numerous experiments to find a cause for this trouble, including an inspection of the metal from which the cylinders were made and a study of the design of cam and valve spring, it was found that the difficulty was due to the high temperature attained by the metal. When the valve and seat were heated to a high temperature by a reducing flame, the wear of the seats was sufficiently rapid to amply explain the difficulty. After this probable cause of the trouble was determined, it was found that the cooling of the valve seats which showed the greatest wear was somewhat defective, thus permitting them to attain an excessive temperature under conditions which often occur in practice.

Unique Sling Clamp

To aid in removing some types of cylinder heads without injury to the gaskets I have made a special type of clamp sling to be used with the chain hoist. It is made of $\frac{1}{2}$ x 4" steel in two pieces as shown in the self explanatory sketch, adjustable for width. The clamping set screws are put in at an upward angle to make them more effective and prevent slipping.



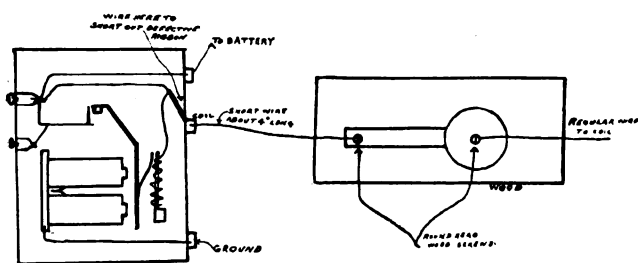
planatory sketch, adjustable for width. The clamping set screws are put in at an upward angle to make them more effective and prevent slipping.

Work Shop Experience Prize Contest

Contest Closed December 15th—Winners Announced in January

REPAIRING THERMOSTATIC SWITCH

As there are thousands of Connecticut Thermostatic or kick-off ignition switches still in use on Chevrolets, Briscoes, Gray and Dort cars, as well as many others, nearly every garage man has been called out to start a car, or to repair a switch where the Thermostatic ribbon has burned in two. In my experience I have seen many cases where the repair was made by soldering a wire inside the switch to short out the ribbon and this kind of repair is O. K., but there is no protection for the coil in case the switch is left on, and no repair man is justified in removing the kick-off feature unless he makes proper provision for the coil protection, as the average car owner is totally ignorant of these facts. As practically all of the later cars have a resistance unit mounted on the coil, to protect same, I have found, as these are carried in stock (while a new thermostatic ribbon is not) that a resistance unit makes an excellent repair after shorting out the broken ribbon, but on the Chevrolet 490 there is no place on the coil to fasten a unit so I put it under the cowl board a few inches from the switch in wooden pieces that support the cowl by using two wood screws the unit can be mounted on wood as well as on top of a coil, and the wire that goes to the coil fastened under the screw head and from there to switch, as per drawing herewith. This



same principle can be applied to any other car having kick-off switch and makes an excellent repair at a moderate price, compared with the other, as some garages put on an entirely new switch which means considerable cost.

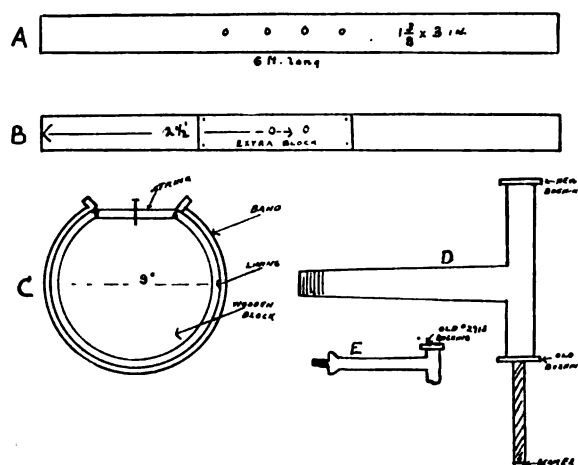
ARTHUR SCOTT, Canada.

FORD STUNTS

A and B are a couple of sticks which I use to support a Ford Motor. Each is 6 feet long, $1\frac{3}{8}$ " thick and three inches wide. A has four holes bored to take the four studs which hold the manifolds. B has an extra $1\frac{3}{8}$ " nailed to the side which goes toward the block and two holes bored through where water inlet connection fastens on on the block, two cylinder head cap screws $3\frac{1}{4}$ inches

long fasten it on, the extra $1\frac{3}{8}$ inches bring it out so it will pass between the pedals. The middle of these sets of holes are $2\frac{1}{2}$ feet from the end towards the rear of the motor and $3\frac{1}{2}$ feet from the crank end; the tops of pieces are flush with the top of block after head is taken off.

A horse at each end supports it. It may be turned over to work on bearings or hang down to work on valves or carbon.



C is a circular block of wood $1\frac{1}{2}$ inches thick and 9 inches in diameter. Band is placed around it together with the lining. A string is placed around the lugs and a nail twists and tightens the string; this side of the block is flattened a little. Drive rivets into wood, take off and clinch. Lining fits smooth all around.

D is rebushing spindle body. Drive out the most worn bushing and put in new one. Put reamer through remaining old bushing and ream new. Drive out remaining old bushing and put in second new one. Run reamer through first new one and ream second.

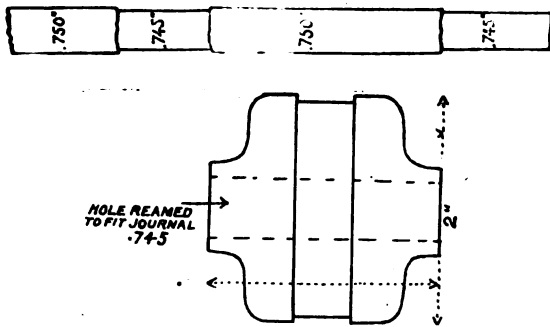
It is no trouble to get the holes to line up. E is old spindle body bushing used in spindle arm in place of No. 2714 bushing. File off sides of arm where yoke has worn it, also inside of yoke where arm has worn it. Countersink lower side of bushing hole in arm, put in an old No. 2713 spindle body bushing with the flange up. Saw off about $1/16$ inch long, rivet it into countersinking and ream with No. 2714 reamer. File off so it will fit into yoke. Flange makes a wide surface for yoke to rest on and fills up worn yoke to stop rattle.

A. W. ANGSTRAND, Ill.

REPAIR FOR CADILLAC CAM SHAFT BEARING

While overhauling a Cadillac motor (ten years old) I found four of the cam shaft bearings worn so that it

was advisable to renew them. This shaft is a straight one $\frac{3}{4}$ inches in diameter with three of the bearings between the cams, which latter are fastened to the shaft by taper pins, and when they were removed I found the journals on the shaft worn down about .005" below original diameter, so that a new bearing would be too loose if the hole was reamed to slip over the shaft where

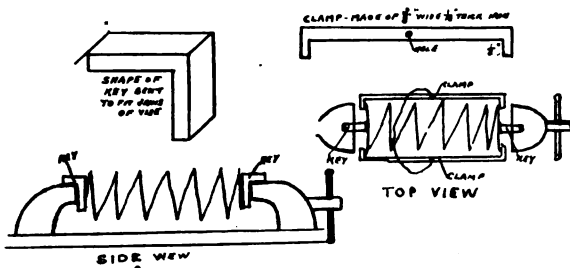


it was not worn. Therefore, I reamed the new bearings to fit the worn journals. They were then heated until the expansion permitted their being slipped over the shaft to correct location on journals and after they were cold they were a very good fit, taking up all lost motion. This process was of course not necessary for the end bearings. The sketch enclosed illustrates the method used.

B. H. HAWKINS, Mich.

MAKING IT EASY

Here is how I make it easy to install valve springs: First make two clamps of a piece of iron about $\frac{1}{16}$ " thick and about $\frac{3}{8}$ " wide, bending ends over about $\frac{1}{4}$ ". The length of the clamp is found by compressing the valve spring in a vise so it will fit on easily. The clamps keep the spring compressed after taking it from the vise. Drill a hole in each clamp about midway between the ends and attach together with a piece of wire about five or six inches long.



Get two rear wheel keys or pieces of iron about the same size and bend them so they will fit the jaws of the vise as shown in diagram. This is for the purpose of keeping valve spring away from jaws of vise so you can slip the clamps on the spring when it is compressed. After clamps are put on spring it may be taken from the vise and installed. Put on the valve spring washers and

put in the pin before the clamps are removed by pulling the wire attached to both clamps, and the valve is all set. Several sizes of the clamps will probably fit all cars.

M. FRANKEL, N. Y.

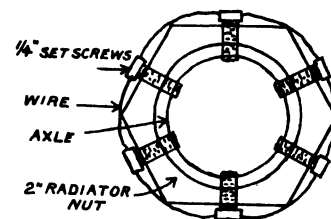
HOW HE FIXED A DANIELS REAR AXLE

January 12, 1922. I took a chauffeur's position driving a Daniels car which had seen quite some abuse.

The back axle was pretty bad. It was a full-floating type rear end. The large nut had been taken off quite a few times and apparently cross threaded every time it was put on, till the threads had given way and the wheel was allowed to slap side-ways quite freely. At the time I took it off the nut was hanging on two threads. To repair this I proceeded as follows.

After looking it over I found that the axle was worn so much from the wheel running out of true on it that it was impracticable to cut new threads and expect them to hold.

So instead I went to a local steam-fitter's and bought a large nut that is used on radiator work. After filing the



threads out a little on the nut and smoothing off the axle a bit I got the nut to fit on the axle fairly tight. I then drilled and tapped holes in each facing of the nut for $\frac{1}{4}$ " set screws, put the nut in position on the axle, marked corresponding marks on the axle to the holes in the nut, took the nut off and drilled the axle. I then put two thin washers on the axle put the nut on and used a jack against a beam to press the nut a little tight and put in my set screws.

Needless to say, the job was a perfect fit, no side play and wheel revolved freely.

Up-to-date it has worked perfectly and has not been off save to reline the brakes. I enclose a sketch of the completed job.

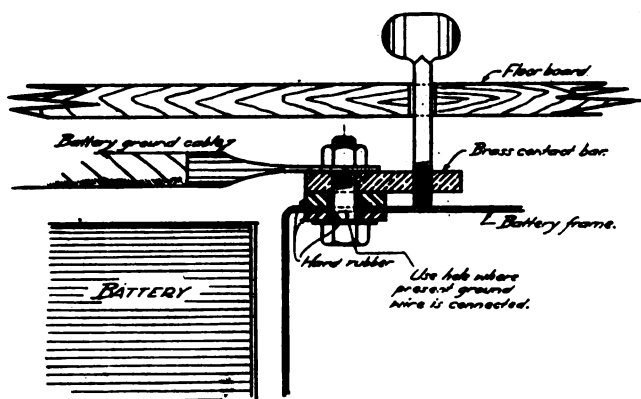
F. B. BUNT, L. I.

SECRET BATTERY SWITCH

As my contribution to the Workshop Experience Prize Contest I submit herewith a sketch of a device calculated to protect a car from thieves. Two features of this device that should make it specially attractive are: one, that it is inexpensive; and the other, that it is small and easily constructed.

The idea of this arrangement is to break the ground

connection of the battery. All that is necessary to install it is to disconnect the ground wire and secure a screw and a piece of hard rubber tube which will fit the hole left by the old connection. In addition, obtain a piece of $\frac{1}{2}$ " thick brass which is to be insulated from the frame with a section of sheet hard rubber. A brass thumb screw, long enough to extend through the foot board, completes the requirements.

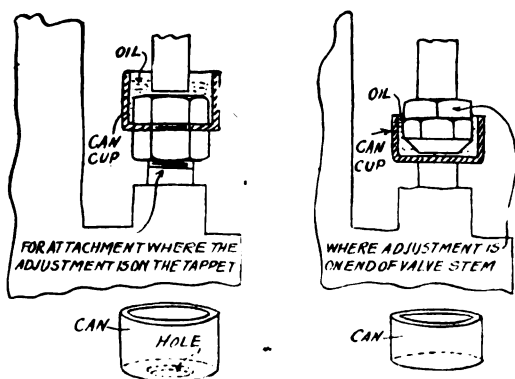


When the thumb screw is tightened down a ground connection results and the car is ready to run. When the car is stationary loosening the thumb screw a turn or two breaks the circuit. Disguised as a "phoney" bolt the screw will invariably defy detection.

A. WIRSING, N. Y.

OIL CUP SILENCER FOR ENGINE VALVE LIFTS

Where troubled with clicking of valve tappets, which regardless of close and frequent adjustments respond after a short interval with the usual clattering, make attachments as are shown in the illustration below, of inverted oil reservoirs, which will cover the gap at the valve stem and effectively silence this clatter. It is a



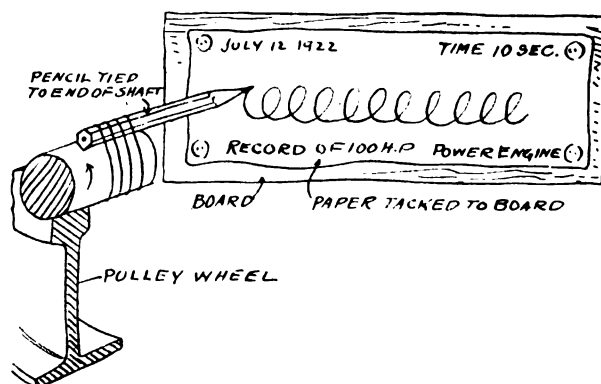
simple matter to provide suitable cups, as tin or aluminum, tops from small neck cans are punched with a hole corresponding to the size of the tappet and this is held between the adjusting nuts on the tappet. When the adjusting nuts are on the end of the valve stem, these caps can be inserted without punching the holes. The oil following the valve stems, enters these cups and keeps

them continuously filled without further attention. This is a simple expedient that can be applied to practically any motor.

G. A. LUERS, Washington, D. C.

TRACING A RECORD OF SHAFT REVOLUTIONS

While many methods of counting the revolutions of a shaft have been devised, the method of making a permanent record of the revolutions, as illustrated below, is a new idea which is used by a mechanic operating a steam engine in a power plant. The simplicity of the record taking means would suggest its adoption, even

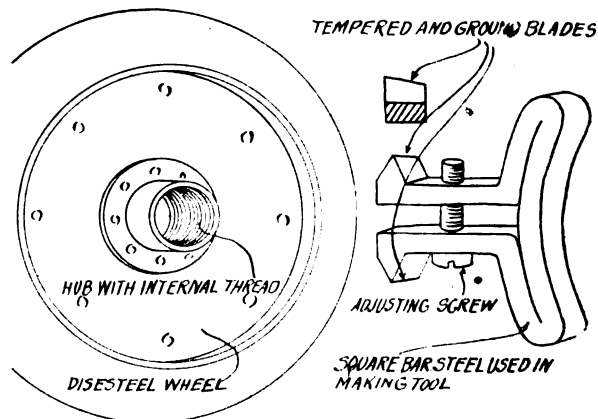


when a speed indicator was available, as the record made can be kept for reference purposes. In description of this a pencil is attached to the end of the shaft with twine or a rubber band and the paper backed up with a board or a heavy card is held against the pencil and moved across while the shaft turns. It is necessary to use a definite period of time while marking. The number of circles multiplied by the part of the minute are the revolutions per minute.

G. A. LUERS, Washington, D. C.

CUTTER FOR RESTORING THREADS OF LARGE DIAMETER

Threaded hubs, face plates, hub caps, pipe caps, valves, etc., in which the thread is burred or damaged can be



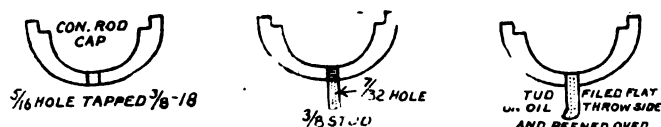
restored by the cutter shown in the below illustration. The screw is for purpose of adjustment.

G. A. LUERS, Washington, D. C.

DEVICE FOR PREVENTING BURNED BEARINGS

In some motors in which the connecting rod bearings depend on the splash system for lubrication, there are no oil dips on the bottom caps, as for instance on the White Motor, Model G. K.

A great number of these motors we found came to the shop repeatedly with burnt connecting rod bearings. We adopted the following method of installing oil dips or scoops with excellent results. We got a $\frac{3}{8}$ " \times $1\frac{1}{4}$ " stud 18 thread on both ends and drilled this stud through,



on the speed lathe, using a $7/32$ " drill. We then drilled through the bottom connecting rod cap and babbitt, using a $5/16$ " drill and then tapped with a $3/8$ -18 tap. By screwing the drilled stud into the cap and babbitt, the stud acted as a reliable dowel holding the babbitt securely in the cap. We then filed the side of the protruding stud on the splash or throw side and peened the end over with a light hammer.

This job makes an oil dip or scoop that does away with loose babbitts and burnt bearings.

HUGH O'NEILL, N. Y.

ROADSIDE HORN REPAIR

While touring the White Mountains of New Hampshire last summer I chanced upon a motorist at the roadside, much disturbed over the fact that his horn had failed. The roads were rather congested with holiday traffic and the driver was afraid to continue with the horn out of commission.

A little experience with electric apparatus with a few "kinks" I have gathered from the A. D. & R. enabled me to apply the usual tests which resulted in locating the trouble in the horn. Inspection revealed that the wire connecting one of the brushes had either broken or burned off, and not enough wire was left to make a new connection. In neither car could we find a particle of wire suitable for even a temporary repair. I was about to give it up as a bad job when I recalled some of the "Red Devil" stunts which appeared in the A. D. & R. some time ago and while making one more search for something which could be used for a connection I happened to pick up a box of spare valves inside, and there was the answer. The fine wire which forms the spring of the valve inside did the trick. It was only a few minutes' work to twist this fine wire securely around the brush and reconnect it into the circuit, making a perfectly good roadside repair, and one which I afterward learned gave no trouble during the entire trip.

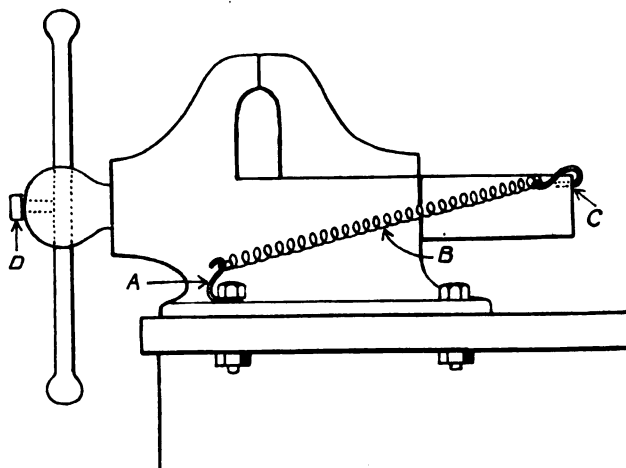
I am not contributing this with the expectation that it is a prize winner, but rather as a testimonial that it pays to read the A. D. & R.

E. H. DREW, N. H.

ELIMINATING LOST MOTION

Here is an arrangement we use on each side of a 4-inch 40-lb. machinist's vise that entirely eliminates the lost motion on the sliding jaw thereof.

"A" is a hook secured under one of the bolts at the base of vise. At "C" drill a $3/16$ " hole $1/4$ " deep in the sliding arm of vise. "B" is three inches of coil spring cut from an old window-shade roller, with a short wire hook at each end. Drill and tap out a $5/16$ " hole at "D" for a set-screw to hold vise handle in central position.



One "spin" will open vise three inches and one "spin" will close it on the work.

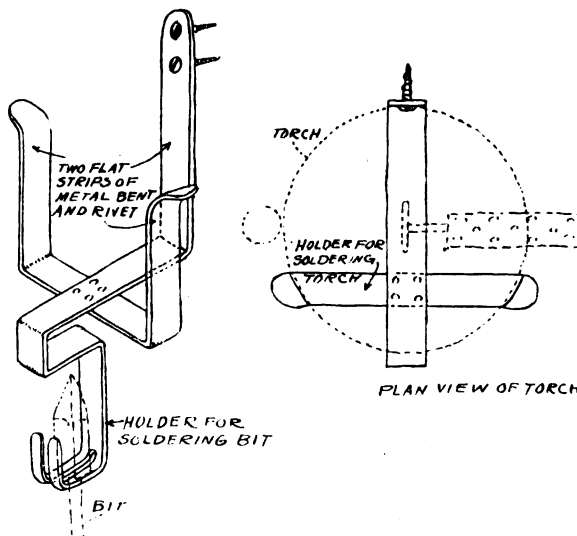
For heavier vises use section of door-spring on each side.

Can be adapted to swivel-base vises also. We find that this simple arrangement speeds up vise jobs from ten to twenty per cent.

L. M. WHITE, Kansas.

HOLDER FOR BLOW TORCH AND SOLDERING BIT

It frequently happens that a blow torch is knocked off the bench and in consequence seams are opened up or the



valve and pump are damaged. A better practice is to hang up the torch and for this purpose a holder for hang-

ing the torch can be made as is depicted in the attached sketch with very little material and labor. The holder is made of two strips of sheet iron with simple bends and a riveted joint. The extension shown is for the purpose of supporting the soldering bit. This is a convenient arrangement inasmuch as having the torch and bit together avoids losing one or the other, apart from the protection afforded in placing the torch where it is not readily knocked down.

G. A. LUERS, Washington, D. C.

"SOLDER REPAIRING"

Solder is thought of mainly as a hole filler or leak fixer, but the uses to which solder can be put are varied and numerous.

I have found that it makes a very satisfactory repair when used to tighten loose fitting nuts or screws such as are used in electrical equipments. Many times the thread of a small screw or nut becomes stripped and it is not an easy matter to find a new one that will fit. By using a little solder the threads can be filled and taped out. If one is an apt hand with the soldering iron and careful not to put any more solder on the part than is necessary there will not be any use of cutting new threads as the nut can easily be screwed home.

Sometimes it is found that a hole through which a screw or small bolt passes has become worn to such an extent that the parts are not held in proper position or relation to each other. By filling the hole with solder and reaming a tight fit can be had on the screw thus holding the parts as they should be.

For small screws as many used in electrical equipments these repairs will be found to make a job that is far from defective.

W. B. HILER, Texas.

VACUUM TANK TROUBLE

Trouble—Trouble—Trouble every day. Symptoms:—Car would slow down and stop. Car would refuse to start. Trouble was in gasoline supply to carburetor. Gasoline in tank and line to vacuum tank O. K. Tinkering with the carburetor float chamber often cleared up the trouble.

You could never tell when the car would start or stop. Garage advice insisted that leaky float was the cause. Inspection of vacuum tank showed otherwise and all parts operating O. K.

Tank head was removed about eight times during the day with the same results. Everything O. K. Everyone interested gave it up. Once more I decided to take it down and just by chance the trouble was discovered.

"Can you tell what the trouble was?"

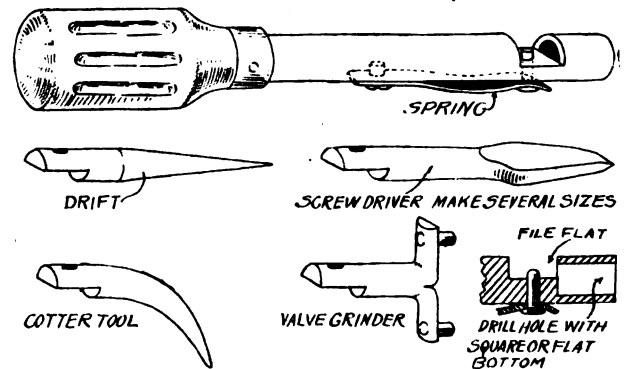
The head of a Stewart Vacuum Tank has two plungers operating in and out. One of these has a bushing or seat in the machine drilled hole. The bushing or seat would drop down with the plunger, reseating itself on return, *sometimes*. Every time the head of tank was

removed, the bushing was in its place except the last time, when the engine had stopped the operation just at the time the bushing was out of place.

O. W. LABDON, Massachusetts.

Handy Combination Tool

The sketch shows a tool of my own design which has proven so generally useful and handy, and is of such simple construction that I know home mechanics and professionals will be interested in it.



The handle and shank can be made from a large size screw driver or from 7/16 drill rod. The drawings give other details.



W. H. Woods-Hyatt Detroit
Sales Engineer

H. A. Brown, Jr., general sales manager of the Motor Bearings Division, Hyatt Roller Bearing Company, Detroit, announces the appointment of Walter H. Woods as sales engineer for the Detroit territory.

Mr. Woods received his engineering training at the University of Michigan. He has supplemented this with years of experience in the selling of mechanical products. His extensive acquaintanceship in all parts of the country, plus four years of selling the Hyatt product, qualify him for his new work.

HOW TO PROPERLY ADJUST BRAKES

(Concluded from page 24)

brakes powerful enough to stop the wheels when the linings were wet, they would halt the car on a dry day with such a jerk that we would be shot through the wind shield.

Speed has a marked effect on braking. At high speeds, brakes do not "take hold" as they do at slower speeds. Your brakes may be in poor shape but you will find that at 5 miles an hour you can slide the wheels by a sudden application while this thing would be impossible at 30 miles. If we consider the holding power at 40 miles an hour as 1, the holding power increases about 15 per cent. for every 10 miles an hour slower speed.

This fact tells us how to drive with greatest economy. Instead of running free, at high speed, down a hill, the car had better be slowed on approaching the top and the descent made at rational speed—the brakes hold well, they do not burn, the descent is made with safety and little braking effort. At high speed, you kick down the pedal and put tremendous pressure on the drums but you don't get results except in heat and rapidly worn linings.

Very few people have any idea of the actual amount of work that brakes do or of the force that has to be quashed in bringing a car to a stop. Simple formulae can be applied to ordinary cases, as may be noted from the following examples, and they may serve to put some reader's problems on a definite basis.

Let e = the kinetic energy of a moving car in foot-lbs.

w = the weight of the car in lbs.

M = the velocity in miles per hour.

p = the total force in lbs. reqd. to stop the car.

s = the distance in feet between the point of application of the brake and where the car actually stops.

Then $e = w (1.47 \times M)^2$

64

If the car weighs 3800 lbs. and is traveling at 30 miles an hour, the amount of energy stored in its moving body is

$$e = 3800 \times (1.47 \times 30)^2$$

64

Just think of that! We all know that 33,000 ft.-lbs. is one horsepower—if the energy in this car were maintained at this rate and could be utilized in some way, it would do almost 4 H. P. of work.

Now suppose that we want to stop this car, either by letting it coast to a standstill or applying the brake. We use the formula.

$$e = p \times s$$

In coasting to a stop on a level road, the only force concerned is that of resistance—the internal friction of moving parts and the rolling friction of tires on the road. Assume this to be a total of 25 lbs. per ton of car weight, or 47.5 lbs. for the car. Then $s = 117,035$

$$\frac{117,035}{47.5} = 2464 \text{ feet,}$$

47.5

which is the distance that the car would coast; in actual

trials, it would be pretty hard to duplicate this, for few roads are so smooth and level as to offer as low a resistance as 25 lbs. per ton together with car friction.

Solving the same problem for another answer and wishing to find how much force must be applied to stop the car with brakes in a given distance, $p = e$ and if we

want to stop in 500 feet, the applied force =

$$\frac{117,035}{500}$$

$$p = \frac{117,035}{500} = 234 \text{ lbs. It is}$$

just as if a giant hand were placed against the radiator and held a pressure of 234 lbs. there for the entire 500 feet. But actually, an external force of less degree is needed because the resistances previously mentioned are always at work and these relieve the brakes of some work.

One more example and we are done. How much does it take to hold a parked car on a grade? The force of gravity reduced to plain English acts with a load of 20 lbs. for each ton of car weight for every per cent of grade. Thus, if our 3800 lb. car is left standing on a 10 per cent grade, which is only a moderate hill, a resistance of

$10 \times 20 \times 1.9 = 380$ lbs. is required to keep it from running away. (1.9 is the car weight in tons.) If the car is descending the hill and it is desired to stop, the necessary force required is this 380 lbs. plus the kinetic energy of the car at its speed, as detailed above.

From these paragraphs, it will be seen that car performance can be reduced to actual figures. When we know in pounds what our brakes are asked to do, we may acquire more respect for them, we may treat them more humanly.

THEIR ONLY AGREEMENT

Although John and his wife had been married twenty years, it was said about town that they had never been known to agree upon anything—except once. John bought a car, and in due course learned to run it—in a way. So he invited Mrs. John for her first ride. All went merrily for exactly two city blocks, when John decided to turn a corner.

"John!" screamed his wife, grasping his arm. "You're going to hit that pole!"

"I know it," said John.

And he did.—Exchange.

If you don't think co-operation is necessary, watch what happens to a wagon when a wheel comes off.

* * *

Remember that a vigorous howl will always attract more attention than a feeble whine.

* * *

The most stubborn fellow in a jury box is generally the one who does not seem to have an opinion.

* * *

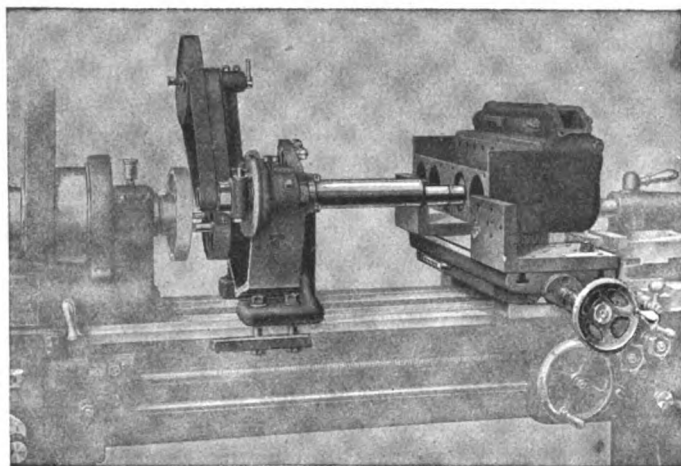
It is better to kick yourself occasionally than have some one else perform the service.

New and Useful Automobile Accessories

KELLENCO PRODUCTS

"Planet" Automatic Cylinder Grinder and Boring Attachment

Unsurpassed accuracy of the product can be obtained with the "Planet," in itself a precision tool, and all movements influencing the accuracy of the product are contained in the "Planet" itself and are



independent of the machine on which it is being used (lathe, milling machine, etc.). The drive from the lathe, milling machine, etc., is flexible, being transmitted in such manner that accurate product can be obtained even when used on inaccurate lathe, milling machine, etc.

The "Planet" is as advantageous for the largest factories as well as for smaller repair shops. For the first as a supplement to internal grinding machines of which the possibilities of application are limited whilst the "Planet" permits grinding pieces of the largest dimensions. For smaller factories, automobile garages, repair shops, etc., the "Planet" is preferable to an internal grinding machine, due to its wider range of application. Furthermore the "Planet" can also be used as a tool, cutter, and surface grinder.

Possibilities of Application: Automatic grinding of all holes in fixed work pieces, such as cylinders of automobiles, gas and oil motors and compressors, bushes, guide boxes, pistons and connecting rods, that is in general all work which requires accurate holes and especially when they cannot be ground on a standard internal grinding machine. The "Planet" can be used for surface grinding and also as a tool and cutter grinder by using a universal head.

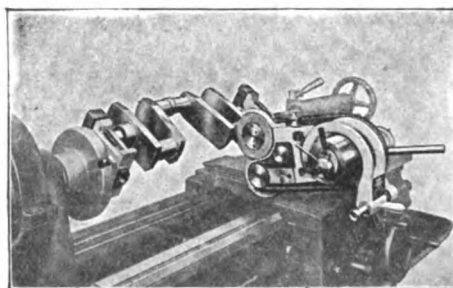
The Standard "Planet" is built suitable for lathes with height of centres of from 7½ in. to 12 in. For lathes having greater height of centres a setting-up piece is used. For motor repair shops the standard "Planet" with 12 in. grinding length and 2 5/16 in. minimum grinding diameter is the most suitable.

The Duplex Crankshaft Grinding Machine is said to be the only perfect lathe attachment, which constitutes a new era in crankshaft grinding.

The Duplex can be used on any medium or larger lathe. In repair workshops where

different types of crankshafts are continually handled, this apparatus is as equally efficient and accurate as a standard machine. Always ready for use, as it is mounted in a few minutes on the slide rest of the lathe. Crankshafts of any type, with short pins, even down to 1¼ in. in length can be ground, as rapidly and accurately as on a standard machine. Simple construction and manipulation, so that the job calls

for no special qualification from the operator. Broad surface of grinding wheel (theoretically 13/16 in. broad) and drive by strong belt. To secure the drive from the centre, two grinding wheels are pro-



vided, which are placed in close proximity to each other, but on two different axes, and in height. Through this ingenious construction, the wheels work alternately, but with the same accuracy as a single wheel. Grinding wheels and belt pulleys run on double ball bearings, fully protected from dust. The bearings of the grinding wheels are adjustable against lateral wear and side pressure. Fast and loose pulleys are provided on the attachment itself, so that the drive can be obtained from the line shaft, or simply by a counter-shaft. Adjustable throw blocks are supplied with the apparatus. Ingenious diamond fixture for attaching to crankshaft, with diamond for truing and rounding wheels, is included in equipment. Small initial outlay, without any additional expense. Highest precision and first class workmanship.

All inquiries should be addressed to the manufacturers, L. Kellenberger & Co., 120 Rutgers Ave., Jersey City, N. J.

AUBURN INCREASES CAPACITY

The capacity of the Auburn Automobile Company's factory at Auburn, Indiana, has been increased by the installation of a complete department for drying paint on bodies. This addition has been necessary to take care of the increased production at the present time and the anticipated production of 1923 because of the addition of the Smaller Six to the Auburn line and the demand for the medium priced type of cars built at the present time.

The drying department added is of the most up-to-date type. It has the modern paint drying feature whereby warm air, with just the right amount of moisture in it, is circulated.

ACCESSORY MANUFACTURER PUTS OUT VALUABLE TRADE BOOK

"To sell more, tell 'em more," might well be the motto of Advance Automobile Accessories Corporation, as evidenced by a "Data Book" that has just been issued by them for distribution to jobbers, jobbers' salesmen and a limited number of preferred dealers. The book is both a presentation of the advertising plans of the Company

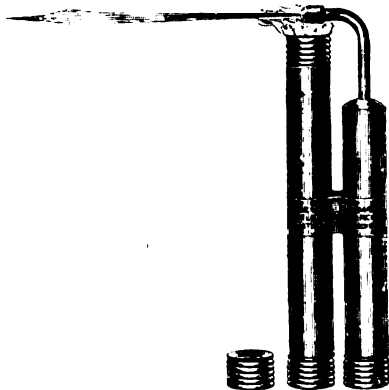


for the coming year and a text book for the trade. It tells how the company is going to get back of its own products and gives the reader the kind of information and selling talk that can be used with good advantage in talking to the consumer, or the dealer, as the case may be. The very advertisements that are shown in the book as examples of what the firm is doing, are packed with selling information. These are supplemented with a clear presentation of the advertising policy of the company, views of the plants in which the various articles of the line are produced, and the selling helps which are supplied to the jobber and dealer.

The book also contains a variety of useful information such as resale prices and discounts, shipping weights, cuts for jobbers catalog. In short, the book is a real "Data Book," and supplied in the same size as the standard letter head, so that it slips into the data files of the jobber, or by perforating the sheets, into the loose leaf catalog of the jobbers' salesmen. Any dealer who would like copy of the book can secure it by addressing the Chicago office of Advance Accessories Corporation on his business stationery.

LENK AUTOMATIC BLOW TORCH

This torch generates its own power and produces a flame of 1400° Fahrenheit in ten seconds. It is said to be very inexpensive to operate. Burns denatured alcohol. Electricians and mechanics appreciate the practical value and convenience

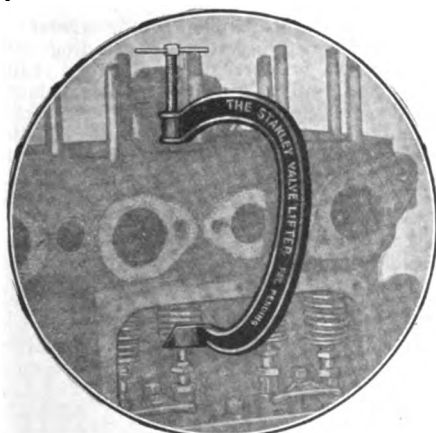


in using this torch as it makes soldering easy. It operates simply, after filling both cylinders, light the wick, within a few seconds a force is automatically generated, producing a long needle point flame. A big advantage is gained over the old fashioned mouth blow pipe. Made to last for years. The size is $5\frac{1}{2}$ x $2\frac{3}{8}$ inches and the price only two dollars. No pumping—no priming—no blowing. Non-leakable. Address all inquiries to the manufacturers, The Lenk Mfg. Co., Boston, Mass.

STANLEY VALVE LIFTER

In its rapid rise to recognition it is said that the Stanley Valve Lifter records a succession of easily won victories.

To initiate a new standard in design and mechanical perfection to possess the ability to combine this in a master production embodying the genius of the artist and the skill of the finished craftsman marks the pathway of real progree in this day of specialization.



Stanley Valve Lifter is strong, durable, safe and practical. It fits 90 per cent of all motors and is very easily applied and as quickly removed. It is very simple in operation and when locked in place it stays there—works around manifolds and carburetors. Holds springs compressed and leaves both ends free. Saves time, money and fingers. Makes valve grinding a pleasure.

Address all inquiries to American Governor Co., Anderson, Indiana.

HANDY GARAGE SHEAR

A tabloid summary of the most important requirement for your complete success, laid down by those who have arrived—is get the shear that will do the work quick and good.

Handy Garage Shear No. 20 is the biggest little shear made. An every day necessity in every garage and repair shop for CUTTING BRAKE LINING, shim stock, sheet packing, gaskets, light sheet steel, wiring battery plates, etc. Capacity 16 gauge sheet iron or brake lining of any ordinary size. An all steel shear. Base is one piece Tee bar to which stationary cutting knife is secured. Knives of high grade tool steel finely tempered and ground. Size of base $7\frac{1}{2}$ by $2\frac{1}{2}$ inches. Length over all 22 inches. Knives $7\frac{1}{2}$ in. long. These shears are shipped packed in individual cartons and ten to the standard shipping package. Are very reasonably priced, and are now being stocked by many of the leading jobbers in automotive equipment throughout the country.

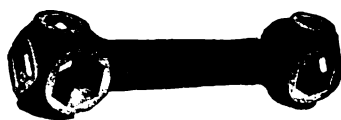
For full particulars write to Simonson Iron Works, Sioux Rapids, Iowa.

**FITS-ALL SOCKET WRENCH**

This is said to be the handiest wrench ever made for the motorist. Ten different size openings including spark plug sizes. No adjusting. Can't slip or spread. Heavily nickeled. These goods are packed in one dozen lots in a three color display carton (red-black-cream) with a cover that folds back making a neat show case display. The usual method of shipping goods in plain boxes has been avoided. This carton is good enough for the dealer to place on the counter or in the show case.

A window poster for the dealer's window, show cases and walls, made of colored paper printed in heavy faced type so the motorist, repairman, etc., may know what the FITS-ALL SOCKET WRENCH, will do and where they may be purchased. One of these posters in a dealer's window or on a glass door or on the wall will keep FITS-ALL WRENCHES on the move and keep the trade happy. This service is free.

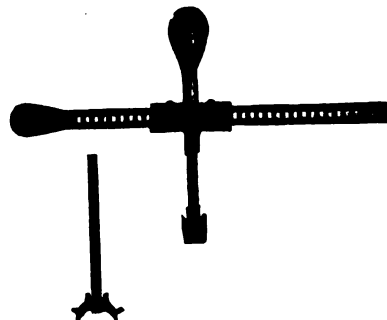
A national advertising campaign is un-



der way and electros for catalogs to the trade will be supplied on receipt of sizes wanted. Our readers may have all the facts by writing to Fits-All Wrench Company, Providence, R. I.

HI-SPEED VALVE GRINDER

Whether or not we reach the ultimate goal of our dreams, if we have done our best to overcome obstacles in our paths, to forge ahead through adverse circumstances, to make the most of what opportunities were ours we can claim success. Here's a Beardsley opportunity for the car owner in the way of a Hi-Speed Valve Grinder at \$2.50. This Hi-Speed Valve



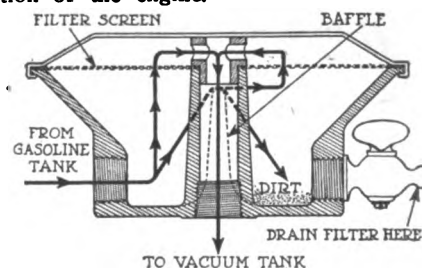
Grinder is constructed on the screw-driver principle (recognized by expert mechanics to be the best for grinding a fine set of valves and for getting the best results) plus speed, which gives it the efficiency of an electric tool. It is light and made of durable material. It comes packed in a handy wooden box with a slide cover. A long and a short shaft, special Ford bit, slot bit, adjustable bit, and a small can of valve grinding compound completes the kit. It will clean up the worst set of pitted valves in record time. It works with a smooth and even motion and not with a jumpy and jerky one, characteristic of most other grinders. Mechanics and users claim that this is their favorite grinder.

Address all inquiries to Loomis-Beardsley Mfg. Co., 1116 Mt. Vernon Ave., Columbus, Ohio.

STANDARD FILTER

With the equivalent of a million holes in its six square inches of mesh, the Standard Filter is guaranteed to function perfectly for the full life of the engine. The mesh is proof against rotting and corrosion because it is made of Monel silk wire very closely woven to form a relatively thick, substantial fabric through which not even light can pass. The slits between the strands are so microscopically fine that they give the equivalent of a million holes as compared to the old fashioned square woven brass wire filter screen.

No dirt can lodge in the screen since the fuel passes through it in an upward direction, the rate of flow being so slow because of the large area that particles never stick to it but are quickly shaken down into the sediment bowl by the vibration of the engine.



It is made by the Standard Filter Co., 370 Jelliff Ave., Newark, N. J., sells for \$3.00 and is readily installed in a few minutes without the use of any special tools or fittings.

NORTH EAST SPEEDOMETER

The North East Electric Co., Rochester, N. Y., has now added a speedometer to its line of automotive equipment. This new instrument is built of the same ruggedness and durability that characterize all other North East products.

The North East Speedometer is of the



magnetic type. Its distinctive features are:

- 1—High degree of accuracy which is maintained indefinitely because of the permanence of magnetic flux density of the magnet.

- 2—Special provision for eliminating the effect of temperature changes upon the accuracy of the readings.

- 3—Moderate speed at which the moving parts are driven which minimizes wear and vibration.

- 4—General ruggedness and simplicity of construction making the instrument easy to service.

- 5—Good size and readability of all indicating and registering figures.

- 6—Convenience of resetting trip mileage.

- 7—Attractiveness of appearance and finish. The instrument is finished in flat black with a polished nickel bevel effectively setting off the face. The face has a special oxidized finish which is absolutely permanent.

Briefly the mechanical construction is as follows:

The scale cup is mounted in a bracket which is doweled onto the top of the main frame of the instrument.

The shaft which carries the rotating magnet has a worm cut on it to engage with



the ring gear which drives the odometer. This ring gear engages internally through a planet pinion with a pair of sun pinions, one of which is held stationary and the other drives the odometer shaft. The revolving pinion has two less teeth than the stationary pinion, hence this arrangement gives a further reduction of speed at which the odometer is driven.

The odometer shaft engages through back

gearing with a clutch that drives the tenths mileage ring of the trip odometer. The trip odometer reads 99.9 miles before returning to zero.

On the season odometer side, the shaft carries a cam which revolves inside a special drive gear so as to give it an eccentric motion which affects an additional 10 to 1 reduction in the speed of the units mileage ring of the season odometer. The season odometer reads 99,999 miles before returning to zero. The odometer rings drive each other through a succession of transfer, pinions arranged so that it requires a complete revolution of a ring to advance the next one 1/10 of a revolution.

The entire odometer is built up as a detachable assembly which can be readily lifted from the frame and taken apart for inspection without disturbing any of the rest of the speedometer mechanism.

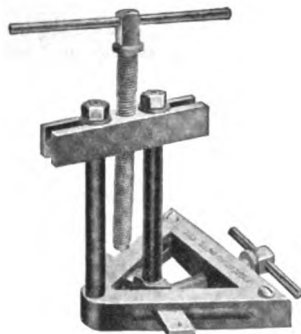
Oiling of the instrument is taken care of by felt oiling wicks resting against the magnet shaft, one above the odometer; the other below. An additional wick is provided in the back drive type of instrument to oil the horizontal drive shaft. These wicks hold sufficient oil to last a year without requiring attention.

These instruments are being built in two styles, one for attachment of the shaft at the bottom and the other at the back. The drive shaft used is of the multi-coil type and is extra heavy.

North East Speedometers have already been adopted as standard on Dodge Brothers and Reo Cars.

GREB BALL RACE PULLER

The one word which best embodies the elements of success in business is thoroughness. It is said that the Greb Model G Ball Race Puller is the one race puller to



which intelligent garage men have intrusted their time—an unanswerable acknowledgment of its achievements.

Greb Model G Ball Race Puller can be locked into any Ball Race from the smallest size up to 2 in. without any changes, thereby making it the only universal Ball Race puller on the market. Has a reach of 5 inches. 5/8 in. diam. screw.

The Greb Company Inc., manufacturers of automotive and service station equipment will be glad to give you full information and literature.

BRUNNER AIR COMPRESSORS

Model 932 Assembled Unit. So well known and widely used is this style of unit that a detailed description is unnecessary to prove its perfect fitness for garages, oil stations, tire agencies and accessory stores. In fact, a unit of this character has come to be associated in the mind of the trade with free air service. It is only necessary then, to mention the features that are distinctively Brunner.

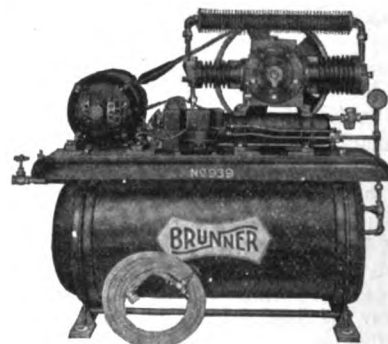
Today this machine meets all the requirements of the average automotive establishment. A garage operating pneumatic shop tools will require greater air capacity. An oil station with air operated gasoline pumps must have a heavier machine. The No. 932 does, however, satisfy the air needs of the vast majority of dealers.

The Brunner Model 939 is the fastest-



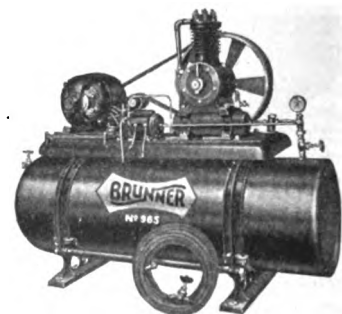
working 3/4 H. P. unit built. Pressure in the 32 gallon tank rises from zero to 175 lbs. in less than twenty-five minutes. A pressure of 25 lbs. is a matter of five minutes or less. The answer is not excessive speed; it is the astonishing efficiency produced by dual valves, large intercooler and snugly fitted, polished pistons.

The Brunner Model 965 is free from vibration, the No. 105 compressor being of balanced load type, with all running surfaces ground and polished. The operation of this giant type outfit is as smooth and



silent as an eight-cylinder motor. Nevertheless, Brunner practice of grinding all fitted joints is carried out, locked cap screws are used to clinch the power plant on the saddles, and the heavy seamless tank is clamped in place with four heavy iron straps. Years of constant operation will not affect the rigid stability of this rugged and reliable outfit.

Model 965 has ample capacity for the largest and busiest filling station, even handling three or four air-driven gasoline pumps. Pneumatic truck tires are quickly

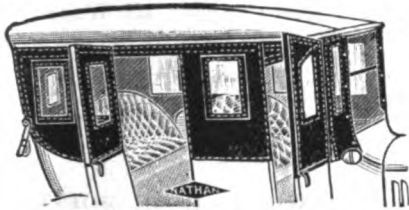


inflated from the large tank. No degree of air demand will find it unready or inadequate.

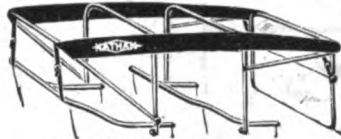
For full particulars write Brunner Mfg. Co., Utica, N. Y.



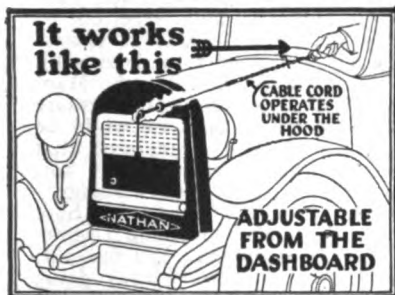
Fabric Specialties



Side Curtains for Fords with Door Rods



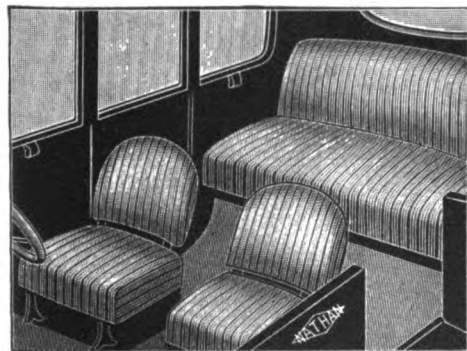
Top Pads for Fords



Spring Shutter Radiator Cover



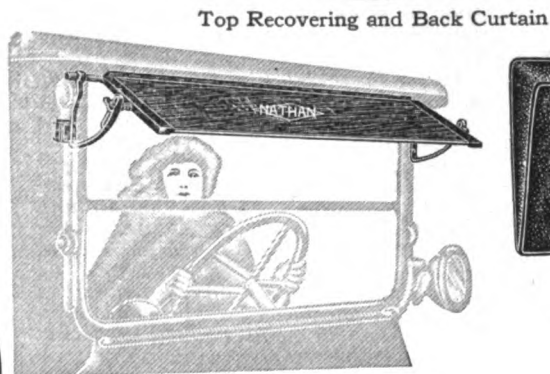
Bag for Tools, Tire Chains, etc.



Presto Slip Covers

A Few Nathan Specialties

It will pay you to send for our complete catalog with **NEW LOW PRICES.**

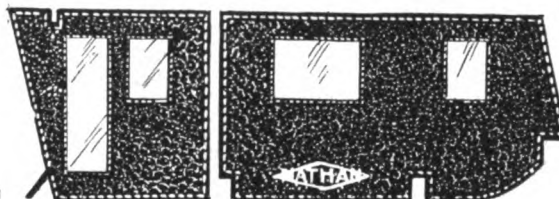


Top Recovering and Back Curtain

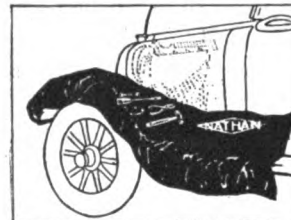
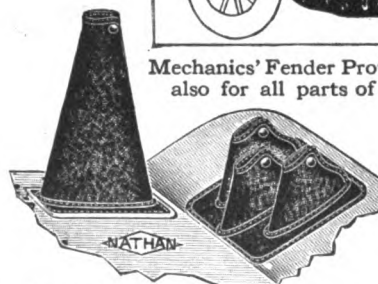
Visor



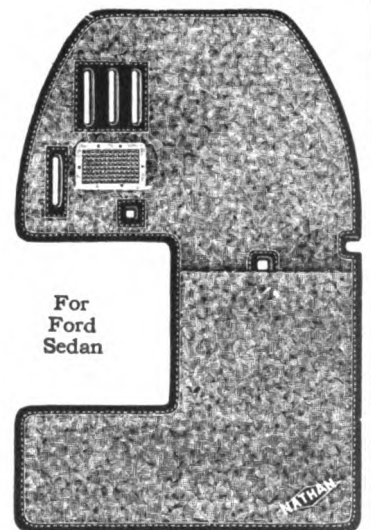
Cushions

Tire Covers
Lettered with
your advertisement

Standard Side Curtains for Fords

Mechanics' Fender Protector
also for all parts of car

Brake and Pedal Boots for Fords

For
Ford
Sedan

Carpet Floor Mats

55 Fifth Ave., New York City
Dept. D R

Nathan Novelty Mfg. Co.

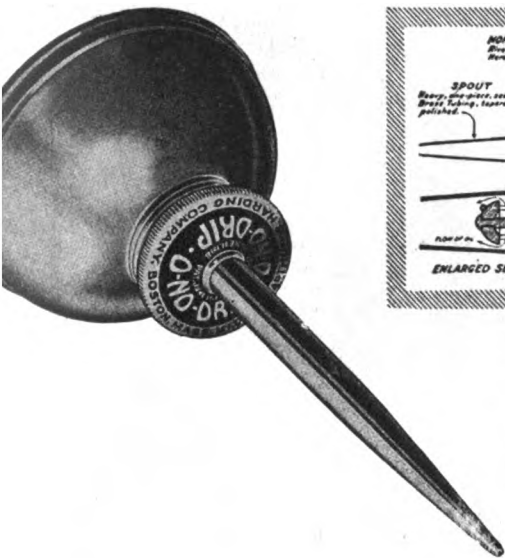
Western Representatives
STANDARD MOTOR PARTS CO.
Chicago, Ill. So. Michigan Ave.

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O-NO-DRIP OIL CAN

O-No-Drip will not leak, when filled with oil, even if held upside down. Brass spout seamless; drawn from best quality brass tubing.

O-No-Drip can made of steel, copperized inside and outside. Double crimping around bottom of can, ensures strength and flexibility. Can tested at 110 pounds air pres-



sure. Spout tested with gasoline. Gasoline will not evaporate from O-No-Drip, making it a success as a priming can. Nothing to get out of order.

O-No-Drip is fool-proof and practical. Guaranteed to give entire satisfaction to the user. Oil flow always under full control. User can release oil from O-No-Drip one drop or five drops at a time, or in a steady stream. It is the cleanest to use and saves oil. It is built stronger than necessary. Attracts immediate attention because it is handsome and substantial. Each O-No-Drip is packed in an individual three-color carton, showing, on outside, diagram of operation. Every part of O-No-Drip is made of highest quality material. It is patented. It has an easy-to-remember name. It eliminates the usual annoyances of every-day oiling jobs.

O-No-Drip standard size is $\frac{1}{2}$ pint, with $4\frac{1}{4}$ in. straight spout. Orders now being taken, and to be filled in the near future, for the following:

Pint size O-No-Drip with 9 in. spout, curved at end. For all manufacturing plants, machine shops, and general machinery use.

Individual size O-No-Drip for typewriters, sewing machines, bicycles, phonographs, vacuum cleaners, and other domestic, office, and garage use.

The O-No-Drip individual size is shown on an attractive display card, holding twelve cans.

Address all inquiries to the manufacturers, Arthur S. Harding Co., 100 Boylston Street, Boston, Mass.

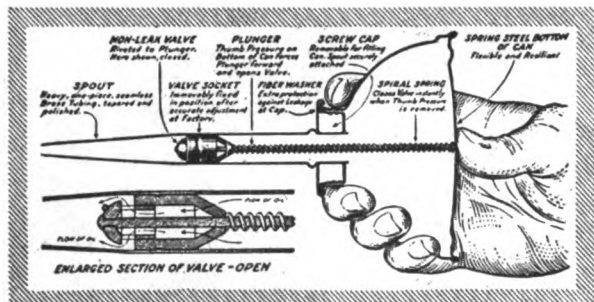
LOMAR SHOCK ABSORBERS

The B Staff Selling Organization Central Office Canton, Ohio, Eastern Office Lake Waramaug, New Preston, Conn., have been appointed exclusive factory Distributors for the Lomar Shock Absorbers for Canton & Youngstown, Ohio, Pittsburgh and the States of Conn., R. I., and Mass. They are appointing a number of sub-distributors in these districts.

K-D VALVE SPRING LIFTER

The K-D "Universal" fits practically any make of car. It is said to be the one spring valve lifter that replaces valves as easily as it removes. Some of the main points or features are:

1. Jaws remain parallel throughout the entire lift, eliminating all possibility of the washer or spring binding on the stem either



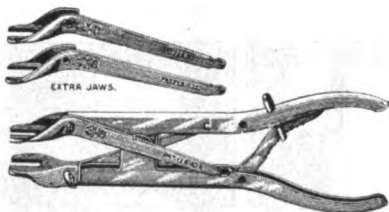
in removing or replacing the valve.

2. Extra jaws, instantly interchangeable, make the tool adaptable to practically all sizes and types of motors.

3. Locking device will stay locked in eleven different positions and will hold lifter in place when the spring is raised, thus allowing operator free use of both hands.

4. "Parkerized" against rusting and made entirely of pressed steel. Practically indestructible. Guaranteed against defective workmanship and material.

There are four jaws furnished with every lifter, each having a different sized opening. This enables you to use the jaw with the proper sized opening at the proper place. Don't try to drive a $\frac{1}{4}$ inch key or horse-shoe washer through a jaw having a $\frac{1}{2}$ inch opening by driving on top of valve with a hammer just because the $\frac{1}{2}$ inch jaw was on the lifter when you picked it up. It can't be done. You will



not only be abusing the lifter but inviting future motor trouble through bent valve stem. Equip your lifter with the right size jaws before you try to use it.

The locking device is so constructed that it remains entirely within the handles. It is absolutely positive and will hold the jaws at intervals of practically every eighth part of an inch throughout the entire lift. The K-D Lifter is the only lifter having so



sensitive a locking device. You will notice as you close the handles that every time a new tooth on the ratchet goes into place a sharp click is heard. This signifies that keeper is holding on a full tooth. Never stop on a half tooth, but stop when you hear the click.

In writing to The K-D Manufacturing Co. of Lancaster, Pa., don't fail to ask about the K-D Special for Ford cars—it has all the advantages of the "Universal," with the exception of the removable jaws.

F. A. DETWILER APPOINTED DISTRICT MANAGER

Mr. F. A. Detwiler, for six years with the Maxwell-Chalmers Company, has been appointed District Manager for the Atlanta, Georgia, territory of the Anderson Motor Company, Rock Hill, South Carolina, builders of the Anderson "Coachbilt" Six. His headquarters will be in Atlanta at the Hotel Winecoff.

The Garland Sales Company, 221 Woodard Ave., Detroit, Mich., has been appointed by the Anderson Motor Company, Rock Hill, South Carolina, builders of the Anderson "Coachbilt" Six as distributor for the state of Michigan and the Province of Ontario, Canada.

THE MARS SWIVEL HOSE JOINT

The Mars is simple in design and construction. Absolutely nothing to get out of order. The ball joint is made of special hard brass and is finished to a thousandth part of an inch. In any direction the Mars will move 70 degrees inclusive; that's more than any possible angle the hose might be twisted. It's a piece of equipment that every operator has been wishing for. Makes possible quicker hose drainage—adds to the length of hose—drops the hose closer to a large number of pumps (on account of their construction) and prevents the motorist from carrying it away doing damage to hose and pump.

QUICKLY—EASILY INSTALLED

Just detach hose from pump—and screw the Mars Ball end on to the pump's discharging pipe. Then attach hose to the Mars. Requires only a few minutes time and a wrench.

Diameters: $\frac{3}{4}$ in.—1 in.—1 $\frac{1}{4}$ in. supplied on all types of pumps—curb pumps, indoor pumps, portable wheel carts.

Mars Hose Joint sold under a guarantee. Special packing and take-up on ball assures tight joint. Fulfills long needed want.



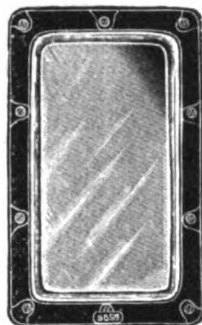
It is said that once you equip your hose with a Mars Ball Joint you'll not have trouble with broken hose again. The hose will last as long as the pump itself.

All inquiries should be addressed to Mars Company, Aurora, Ill.

SOSS

REAR WINDOW LIGHTS For Ford Cars

Including 1923 Model



Ask your dealer
for SOSS Lights
or
Mail order direct

One (1) set consists of

6 Frames
3 pieces of Glass
30 Nuts and
Screws

Packed in neat
cardboard box

\$1.50 per set of 3 windows.

Can be installed in a few minutes by yourself.
Screw driver only tool needed.

Manufactured by
SOSS MANUFACTURING CO.

Department F
Grand Ave. & Bergen St., Brooklyn, N. Y.

The Repairman Knows

Ask him to tell you of the remarkable results obtained by the installation of

PRESSURE PROOF PISTON RINGS

Proper installation will cure oil-pumping, smoking motors, and carbon; insures constant, full compression; saves gas and oil

The best piston ring equipment for winter driving.

PRESSURE PROOF PISTON RING COMPANY
107 Massachusetts Ave. Boston, Mass.



Attention Mr. REPAIRER DEALER

Stops
Motors
from
Pumping
Oil,
Smoking,
Etc.



Eliminates
Spark
Plug
Troubles

New York State Distributors:
MEGSON WIPER RING CO.
1997 Bedford Ave., Brooklyn.

Few territories gone

Do not hesitate

The Auto-Diesel Piston Ring Company
422 Quinipiac Ave. Main Office and Factory
New Haven, Conn.

NOW

*is the time to advertise
in the*

Automobile Dealer and Repairer

Our Extra Circulation

To important Trade lists

is trade stimulating

Automobile Dealer and Repairer

16-22 Hudson St.
New York City

BALLING MOTOR CLEANER

**Cleans Out Grease and Dirt from Every
Nook and Corner of the Engine**

without bruising knuckles, soiling your hands or clothing. 75% of all engine trouble is due to the dirt on it.

THE BALLING MOTOR CLEANER

It is simple and strong and of a quality that can not be made over night.

Owners of Ford Cars are asked to note the easy way in which they can clean the inside and the outside of the commutator, thus eliminating all starting troubles.

The price is \$5.00 per parcel post to any part of the United States. Don't put it off—write today.

The Balling Motor Cleaner is guaranteed and if for any reason you should not be satisfied send it back within ten days and your money will be refunded.

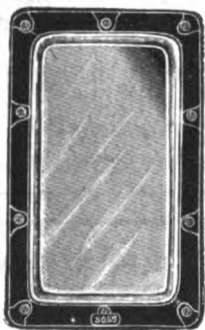


THE BALLING MFG. CO., Inc.
306 Penn St. Brooklyn, N. Y.

SOSS GRIP-TITE CURTAIN LIGHTS FOR FORDS

You can in a few minutes time replace the old or broken celluloid light with Clear Crystal Glass held in place by the Soss Grip-Tite frame.

The frame is made from cold rolled steel which is treated to prevent rusting. A heavy coat of black japan gives the finished frame a high lustre and color to match the fabric. The Grip-Tite feature consists of a patented



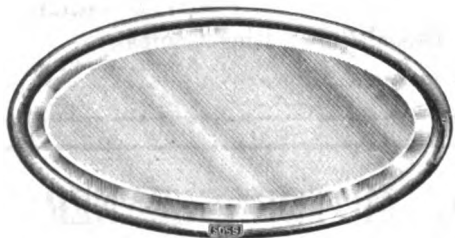
arrangement of projections and recesses which dovetail into each other and hold the fabric tight. This prevents rattling and keeps the curtain from sagging.

DIRECTIONS FOR INSTALLING

(Screw driver the only tool required)

CUT OUT ALL CELLULOID.

Do NOT remove reinforced edges from around openings.



Place one frame on outside of curtain and punch lower right hand corner hole with a wire nail, leaving the nail in the hole. Place inside frame on the inside of curtain, remove nail and place screw, tightening nut. Then punch and bolt lower left hand corner.

Insert the glass between the frames, punch holes, install and tighten other eight screws.

Simple as A B C—write for full particulars regarding other lights and other styles. Soss Mfg. Co., Brooklyn, N. Y.

CHAMPION SPARK PLUG'S NEW CORE

That the Champion spark plug is destined for a new high place in public esteem and that 1923 will be the greatest year in the history of the Champion Spark Plug Company, was the declaration of Mr. Robert A. Stranahan, President, at a sales convention held at the Toledo plant of the company the week beginning November 20.

The convention was attended by all Champion salesmen, 108 in all, and when the merchandising plans for 1923 were revealed to them they were enthusiastic over the year ahead.

It was pointed out to them that 1922 had been a great year—that the total production of Champion plugs will be about 35,000,000, which represents about 60 per cent of all the spark plugs produced in this country.

But Champion executives were strong in their declaration to the men that even this enormous business was but a small part of what Champion would do in the future.

The tremendous progress of Champion, so it was declared, was due to the new core, which has been used in the 1922 production and which is identified by a double-rib.

This core was developed by scientists working in the ceramic laboratories of the Champion company at Detroit and it is declared by Champion men to be far and away the best core ever made for a spark plug.

In many exhaustive tests, both in the laboratory and in cars on the road, it has proved that it withstands temperatures far in excess of those generated in cylinders, that it will not succumb to temperature changes, nor will it lose its insulating properties.

Nearly 30,000,000 Champion plugs with this new core are now in service and they have given such marked satisfaction to motor car owners that the Champion company will push its sales efforts even more strongly in the future than has been done in the past.

In addition to stressing the superiority of the Champion plug with the new Double-Ribbed core, the advertising of Champion will urge on motorists the importance of changing plugs at least once a year to assure better engine performance, the point being made that new plugs will actually save their cost in oil and gas saving, as well as insuring the engine against expensive repairs made necessary by faulty ignition.

Among those who addressed Champion salesmen during the convention were: R. A. Stranahan, President; F. B. Caswell, General Sales Manager; Theodore F. MacManus, Advertising Counsel; Mort C. De Witt, Vice President; F. D. Stranahan, Treasurer; O. C. Rohde, Chief Engineer, and George Nason, Advertising Manager.

CANEDY-OTTO MFG. CO. CREDIT PLAN

The practice of selling on credit, long followed in the retail automobile business and other lines, is being introduced with success into the automotive equipment and machinery business as well.

The Canedy-Otto Mfg. Co., of Chicago Heights, one of the largest and best known manufacturers of shop equipment, has put into operation a credit plant that permits the sale of their equipment by jobbers on the easiest of terms.

The plan is underwritten by the Continental Guaranty Corporation of New York, a banking firm with wide experience in financing credit sales.

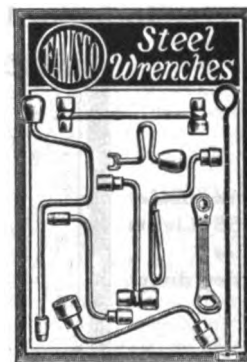
Under this plan, the garage or repair shop owner who desires to enlarge his shop facilities finds it necessary to invest only one-fourth of the cost of the equipment needed, the balance being taken care of in from four to twelve months.

Exceptional convenience attaches itself to the plan for the reason that there is but one document to sign, the usual multiplicity of statements, contracts, notes, etc., having been merged in one simple, compact, instrument.

Both jobbers of automotive equipment and purchasers are taking keen interest in the plan. For the jobber, it means the closing of numerous sales that could not be made on a cash basis, and this without any additional investment of capital or tying up of reserve credit. For the garage owner, it means the immediate addition of equipment that enables the rendering of better service and consequently increased profit.

FAWSCO STEEL WRENCHES

What possibilities for legitimate trade lie dormant because the patron can not find what is desired. He can ask for what he wants of course, but if the counter is crowded with customers he will naturally look around—well, the customers are standing right in front of that big wrench board but further down toward the door, or entrance the Fawscos Small Wrench board 19" x 28" holding 9 popular tools, can



easily be placed for the customers inspection. This is a small board holding 9 tools—5 of each—45 steel wrenches with retail value of \$36.50 many suited to Ford work—all serviceable in any shop. This small board with its first class product will create a bond of good-fellowship between you and your customers. Mr. Dealer—it is an endless source of satisfaction all around, and conserves your good name in the bargain. Address all inquiries to J. H. Faw Co., 27 Warren St. New York City.

A "UNIVERSAL WILKIE" SPECIAL FOR PISTONS AND CONNECTING RODS OF LINCOLN, FORD AND FORDSON MOTORS

Since the addition of the Lincoln to the scope of Ford Service Stations, a three-in-one aligner is paramount. The new "Wilkie" Lincoln-Ford-Fordson Special, takes care of every possible mis-alignment of connecting rods and pistons on all models of these motors.

Three sizes of arbors on one 12 in. mandrel are furnished. Each size is ground and guaranteed to be absolutely accurate. The size of the connecting rod bearings of Lincoln and Fordson Motors are both two inches, so one of the sizes on the mandrel is .002 in. under 2 in. to accommodate worn Fordson or Lincoln motors.

The "WILKIE" ALIGNER is built very solidly. The arbors bolt into a heavy double "V" block which is cast integral with the heavy base. Hence any ordinary bend or twist can be corrected with a wrench without removing the rod from the machine. Provision is made to take up all wear, and the "WILKIE" will last a life-time. It is built of specially seasoned gray iron—all bearing surfaces are ground. Black enamel is the final finish over this smooth casting.

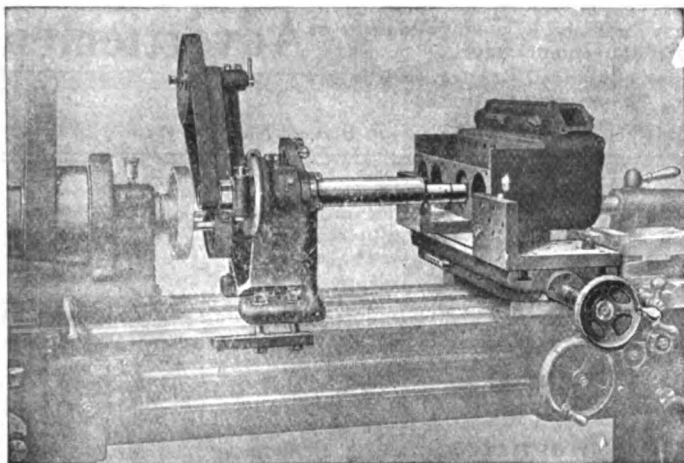
Ford service stations that do work on any other cars or trucks, can align the rods and pistons of those motors by adding the correct size of the mandrel to this universal machine. "WILKIE" arbors can be purchased for \$5.00 per mandrel of these standard sizes.

The complete two-in-one "WILKIE" for Lincoln-Ford-Fordson service stations sells for only \$38.50 f. o. b. factory.

For full and complete information address Wilkie Machine Works, Winona, Minn.

"PLANET"

AUTOMATIC CYLINDER GRINDER and BORING ATTACHMENT



Cylinder Grinding—Crank Shaft Grinding Gear Cutting

done on any lathe with our attachments—in your own shop. 3 Minutes to set up or take off. High Geneva Precision Work.

L. KELLENBERGER AND COMPANY

GENEVA—ST. GALL (SWITZERLAND)

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U. S. A. OFFICE: 120 RUTGERS AVE., JERSEY CITY, N. J.

Ready for Use Including all Accessories

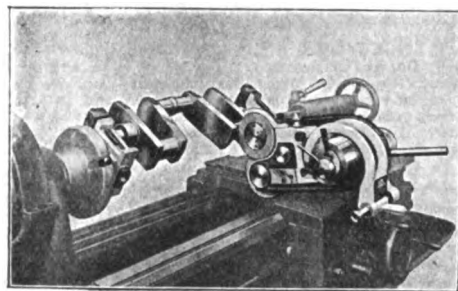
Highest efficiency and lowest prices of all similar attachments.

Delivery from stock at New York.

Ask for Pamphlets. Demonstration easily arranged upon request.

— D U P L E X —

CRANKSHAFT GRINDING MACHINE AT
THE PRICE OF A CRANK PIN TURNER.



A QUICK, SAFE VALVE LIFTER



Adjusted in a jiffy.

A Twist of the Wrist
Lifts Spring Easily.

One Adjustment to
the Engine.

Leaves both hands
free to work—can't
slip back.

Handle adjustable to
operate from different
angles.

Will fit where no other
device can be used.

TRY ONE AND BE
CONVINCED

Price, \$6.50
Postpaid

Try it 10 Days
—Money Back
if Dissatisfied.

Earns its Cost
in Time Saved.

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373 Broadway - - - Milwaukee, Wis.

— P O R T A B L E — FLOOR CRANE AND HOIST

We recommend this low base Crane No. 3 where necessary to run under low places—particularly for Garage work. The "Canton" is a semi-steel Crane—furnished with guaranteed hand-forged tested chain—high quality drop forgings.

It's Built in the Strongest Manner
and is Practically Everlasting

You can't wear it out. It's fully guaranteed. A trial in your shop will soon convince you that a better Hoist could not be built at any price. Write for catalog and full information—today—don't put it off.



The Canton Foundry & Mch. Co.
CANTON, OHIO

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Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange at the uniform price of seven cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than one dollar, however small.

Remittances may be made in postage stamps or in any convenient way.

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PATENTS SECURED—C. L. Parker, Patent Attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

Distributors Wanted

Unusual opportunity for Special Distributor to add three new Ford lines of unusual merit. Write Accessory Department, Acme Belting Company, 107 West Canjon Street, Boston, Mass.

Rebuilt & New

"Rebuilt and new electric motors, generators and transformers, all standard makes, sold, bought and exchanged. Our rebuilt motors stand every test of new motors; 8000 always in stock; send for stock list. Write what you want or have to sell." Fuerst-Friedman Co., Cleveland, Ohio.

Opportunities

Weszy—Squeaky—Springs soon break. Compton Spring Oilers prevent breakage by automatically lubricating spring leaves making smooth riding. Quickly attached without drilling or changing parts. Send \$4.00 complete set eight oilers; Special Ford Set \$2.00. County agents and wholesale distributors wanted. Box 14, Compton Company, 29 Broadway, New York.

Ford Starters

SIMPLEX STARTER FOR FORD \$20. Guarantee. Easily installed. Simple, Durable, Satisfy. Secure agency in your territory. Big profit selling them. American Simplex Co., Anderson, Indiana.

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AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice of four or eight weeks, day or evening. Provision made for out of town men. 322 West 37th St. New York City.

Agents Wanted

Make 16,000 miles without a puncture. Use Insyde Tyres. Positively prevent punctures and blowouts. Double tire mileage, any tire, old or new. Use over and over again. Low priced. Agents wanted. Write for terms. American Accessories Co., B-911 Cincinnati, Ohio.

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Re-Charges All Magnetos Re-Charges All Ford Cars Trucks and Tractors

The "Colpin" magneto Recharge for Ford cars clears all "SHORTS" in the magneto coil and Recharges the Magneto to full strength in less than 5 minutes without removing a single bolt or nut "No storage batteries needed," it operates from any alternating current light socket; will also operate from Farm lighting plants. Direct current circuit, storage batteries and dry cells. Nothing to wear out, No up-keep cost. Weight 12 lbs. Used and recommended by Authorized Ford Dealers.

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MAGNETO RECHARGER—Fords in car, other on bench, Alternating, Adjustable Amperage 10-35, Tester, Trial, Guaranteed, State Distributors wanted, producers, prices, detail. (Reliable) 426 Mary St., Utica, N. Y.



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1 (By Express)
16 lbs. Assorted Springs, \$2.00
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AN EXCEPTIONAL BOOK

"The Automobile Storage Battery—Its Care and Repair" is an exceptional book because the text contains exactly what the title indicates. It is a book for the car owner who desires a greater knowledge of the operation of the vitally important, yet apparently mysterious "Black Box."

It is a book for the auto mechanic who desires better information regarding a unit that he is constantly compelled to work with.

It is a book for the auto electrician who desires more technical explanations of the causes of storage battery troubles.

It is a book for the battery repair man who wants to know the details of construction of the various makes of storage batteries and the best repair methods for each.

It is a book for the Battery Service Station owner, as it explains the latest service stations and complete list of the best equipment.

It is a book for any shop owner as it gives in detail the most efficient yet simplest methods of handling shop records and keeping the financial end of the business in good order.

It is a book for the farmer or resident of a small town who operates a "Farm Lighting Plant" and wants to get the most out of his batteries.

The language is simple and clear, minute details are given when necessary, yet the reader is never burdened with unessentials. The general divisions cover the entire subject and the large number of excellent illustrations, each of which is fully and clearly explained, make the volume almost indispensable to anyone, from laymen to expert, who has any interest in storage batteries. For further information write the publishers, American Bureau of Engineering, Inc., 2632 Prairie Avenue, Chicago.

DESCRIPTION OF NEW MARVEL CARBURETOR AND INTAKE MANIFOLD ON THE NEW 1923 OAKLAND SERIES OF CARS

The intake manifold and carburetor have been redesigned to give automatic control of heat applied to the intake system.

Exhaust gas from the exhaust manifold is lead into a jacket around the hot spot in the intake manifold and from there directly into a jacket around the carburetor body. From this jacket the gas is conducted back into the exhaust pipe.

The rate of heat flow into the intake system is automatically controlled to give the proper amount required at various loads. This control is effected by a damper in the exhaust pipe at a point just above where the gas by-passed through the jacket returns to the exhaust pipe and another damper where the gases leave the carburetor jacket.

The position of these dampers is controlled by linkage connected to the carburetor throttle. There are two positions for hooking up this linkage, one for summer and the other for winter operation.

The heat passages are of ample size to prevent being clogged with carbon.

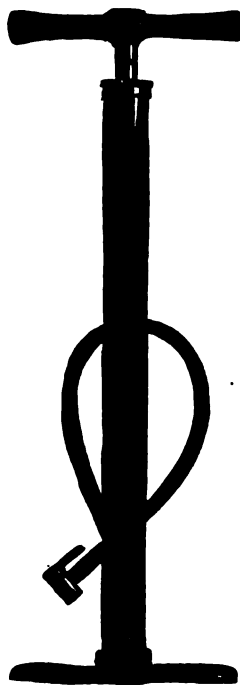
The exhaust gas transfer from the intake manifold jacket to the carburetor is made directly through the carburetor flange without the use of an elbow or flexible tube.

All of the exhaust gas passage joints have packings which prevent leakage and resulting in disagreeable noises and odors.

The new design Marvel 1½" carburetor is now used on which the dash pot is used on the air valve to eliminate fluttering and noise. The air valve spring is enclosed so it cannot be affected by back-firing or burning back in the carburetor.

For additional information address Marvel Carburetor Co., Flint, Mich.

THE "JAMES" TIRE PUMP



The most important thing to know about a pump is—does it pump easily? Next, is it strong and solidly built? Next, is it always ready for instant use?

The "James" Tire Pump meets the demand for a strong and durable single action pump and is superior to the compound two and three cylinder types, for less energy is required to inflate tire.

Extra heavy material and special fittings such as seamless steel tube, solid brass fittings, five-ply hose, patented hose connection, extra large wooden handle, strong steel piston rod, finest cup leather, and heavy malleable iron foot base.

Patented positive Check Valve, the design of which is so simple that the same can be re-ground and replaced in perfect condition by any amateur.

The finish of this Tire Pump comprises the steel barrel, malleable iron base and wooden handle, beautifully done in bright black enamel and the brass fittings highly polished.

Write for complete important details

GENERATOR VALVE CO.

Manufacturers

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No. 20 HANDY GARAGE SHEAR

An everyday necessity in any accessory store, garage or repair shop. Handiest bench shear for cutting brake lining, gaskets, sheet metal, etc.

Sold by Jobbers

Ask us for descriptive circular and name of jobber near you carrying same in stock.

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"HEXALL" SOCKET WRENCHES

"BABY" Hammerless Revolvers

R. F. SEDGLEY, Inc. *Est. 1897*

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ALL THE TIME
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Thirty-Seven BRANCHES

In thirty-seven cities throughout the country you will find Ahlberg Factory Branches, each carrying a complete line of Ahlberg Ground and new ball and roller bearings for the convenience of the trade.

Each branch is under the supervision of a trained bearing specialist, whose services are at your command.

Call our nearest branch when you need bearings or bearing information.

**AHLBERG
BEARING
COMPANY**
321E.29th St. Chicago

Tail Lights

B. H. WIKE

THE position of the tail light naturally makes it difficult to keep it under observation while driving, and as the law compels every car to have such a light burning after dark the driver is therefore hard put to it to make it appear that he is abiding with the law. There are several things to be done to overcome tail light trouble. Users of oil lamps for tail lamps must understand from experience that it is exceedingly hard to keep this style of lamp burning steadily on account of the fact that dust settles round the wick after a time and suffocates the flame. Not only this but also the light is apt to go out from vibration alone. Moreover, an oil lamp lens must be kept clean if the light is to be seen at all, no matter if the flame is burning steadily. We do not recommend the oil lamp for the above reasons. There may be exceptions to our experience with them; though it appears that others do get satisfactory service from them by giving an inordinate amount of care to get good service.

The best type of tail lamp is the electric—the one lighted from a battery. This is convenient and satisfactory, and any trouble one experiences with electric tail lamps does not nearly compare with that realized from the oil form. To be sure the electric tail lamp may go out or be dark and the driver not aware of it until perhaps he is reminded of it by some officer, but there is a way to be reminded of the fact by other means than an officer. Nearly all such lights are operated from the same switch that controls the headlights and the dash. So one movement usually turns on all at once. In others a special button or switch may be needed. The indicating ammeter tells whenever any current is going out, and especially when a light is turned on alone from an individual button or switch it will then be evident. This is one reliable way to tell whether your tail lamp is aglow. If the tail lamp is turned on from the same switch or button that the headlamps are, there will often be trouble to know whether it is burning. If you are having trouble with the tail lamp and are seeking means to keep informed of its actions install a small meter in the rear light conduction cable between the light and the switch. The meter will then tell you by the way its needle points just what the tail lamp is doing, and you can if necessary then apply the remedy you feel is most needed to get the lamp burning again.

Electric tail lamp troubles, where they come from failure to light, resolves into three principal causes, provided the battery is not discharged; namely, a burnt-out bulb, poor contacts perhaps caused by looseness, or by the presence of dust which has sifted itself around the contacts and obstructed the current's passage. During the summer the latter trouble becomes very frequent when dust rises so easily from the car's travel, and this should be remembered when you find out the tail lamp does not light. Whenever you take the lens out to clean be sure you get it back snug and you will thereby greatly

NATIONAL LAC-VAR

THE GREAT AUTO FINISH
A CAR LIKE NEW IN THE MORNING

A clear varnish product giving a fine durable coat with a beautiful luster and unharmed by water, gasoline, oil or mud.

Easily applied with brush, dust proof in an hour and dries thoroly overnight.

Thousands of dealers thruout the country send their repeat orders because their satisfied customers say it is a wonderful finish.



Try a can.

Postpaid on receipt of price.

1/4 Gal. \$2.00.
1/2 Gal. \$3.50.

Write for our Dealer proposition.

The National Automotive Mfg. Co.
Cleveland, Ohio, U. S. A.

reduce the danger of entrance of dust. If the bulb keeps burning out frequently, it is very likely the bulb voltage is lower than that of the current.

General Motors Has 67 Divisions

IN a pamphlet just off the press, General Motors lists and describes its complete line of passenger automobiles. Some of the figures suggested by a tabulation of the information printed are of real interest.

The five divisions of the corporation that manufacture passenger cars are producing 26 individual types of cars, ranging in size from the two-passenger roadster to the seven-passenger imperial limousine. Of all types, the five-passenger sedan is numerically the most popular; the divisions make seven different styles of this car. Next in popularity comes the two-passenger roadster, of which six styles are made. The familiar five-passenger touring car comes in five styles, one from each division. These figures are suggestive of the trend of manufacture, as showing the increasing popularity of the closed models.

If the passenger cars made by General Motors were on exhibition in one hall, with an example of each individual style manufactured, there would be 49 cars shown, divided as follows: Buick, 14; Cadillac, 10; Chevrolet, 5; Oakland, 6; Oldsmobile, 14. The Corporation makes 18 cars of 8-cylinder engine; 15 of 6-cylinder engine; and 16 of 4-cylinder engine.

Gears		Polish (Nickel)		Tires	
Brown-Lipe-Gear Co.	3	Boston Blacking Co.,	14	Miller Chas. E.	6
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Niehoff Paul G., & Co., Inc.	60	Smith & Hemenway Co., Inc.	13	Lenk Mfg. Co., The	60
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REPLACEMENT PARTS**

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24 HOUR SERVICE

*Complete Line
At All Times*

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Necessities Co.**

JOBBER AND DISTRIBUTORS

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Automobile Necessities

**1309 Race Street
PHILADELPHIA, PA.**

DREDNAUT
SHOCK ABSORBERS FOR FORDS



Nothing clamped to the leaf spring. Set of four to fit any model or type of Ford \$18.50 West of the Rocky Mountains \$20.00

Auto Specialties Mfg. Company
Saint Joseph, Mich. Dept. 7B
Windsor, Ontario

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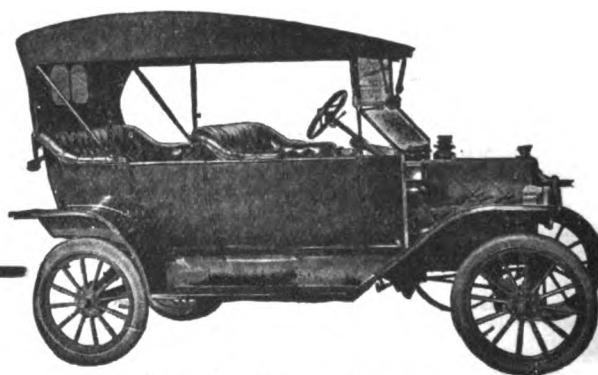
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JANUARY 1923

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Automobile Dealer and Repairer

The Mechanical Motor Magazine
Registered in the U. S. Patent Office

Vol. XXXIII No. 11

JANUARY, 1923

PRICE { 15c per copy
\$1.50 per year

New York Show Demonstrates New Standard of Excellence

**Body Designs and Mechanical Construction Proclaim a Product Superior
to All Previous Years. Closed Cars Got Most Consideration with
Equipment and Adaptability as Special Attractions**

Mileage and Service Features of New Models

**Improvement in Quality and Reduction in
Prices Big Factors in 1923 Production**

ONCE a year the automobile industry of the country makes New York City its headquarters for a week, bringing with it the best that manufacturers can offer to the public. The 1923 visit began in January, when the 23rd National Automobile Show opened at Grand Central Palace for a week's stay.

The display was on a more elaborate scale than ever before. Seventy-nine makes of cars were on display with an accessory list of nearly 400, thus making the show the biggest in the history of the automobile industry, not only because of the number of exhibitors but also because of the quality of the exhibits. Space for more than 350 individual cars was provided.

Manufacturers spared no expense to get the very best ready for the annual exhibition, with the result that the public viewed an array of cars such as has never been gathered under one roof before. Competition in automobile building was never greater, and for this reason more individuality is being built into cars. The display this year occupied the lower four floors of the Palace, an area equal to four city blocks, and every nook and cranny not needed for aisle space was crowded with exhibits. The first two floors were devoted entirely to cars, with perhaps three or four manufacturers showing on the third floor. The remainder of the third floor and all of the fourth floor were filled with accessories. The show undoubtedly proved more interesting and informative to the motorist than any previous affair of the kind in the history of motoring. Every exhibitor whose

product lends itself to actual proof of merit was requested by the show committee to make his exhibit as complete an illustration of the action of the article under working conditions as possible.

Exhibitors of complete cars, as a rule, made every effort toward establishing conviction in the minds of prospective buyers through the employment of cut-out motors and chassis; as well as by hooking in electrical power to actuate the motors and transmissions. Short of showing the car in actual performance this has been the only available means of demonstration.

Nowadays, when every other visitor to the big annual show is a motor-car owner, the accessories divide interest with the cars. In the opinion of S. A. Miles, manager of the show, the accessories can be displayed with such a wealth of illustration that a visit to that section is a liberal education to every motorist.

The following are the cars displayed in Grand Central Palace: American, Anderson, Apperson, Auburn, Barley, Buick, Cadillac, Case, Chalmers, Chandler, Chevrolet, Cleveland, Cole, Columbia, Courier, Crawford, Dagmar, Davis, Dodge Bros., Dorris, Dort, Durant, Earl, Elcar, Elgin, Essex, Franklin, Gardner, Gray, H. C. S., Handley-Knight, Hatfield, Haynes, Hudson, Hupmobile, Jewett, Jordan, King, Kissel, Lafayette, Lexington, Liberty, Lincoln, Locomobile, McFarlan, Marmon, Maxwell, Mercer, Mitchell, Moon, Nash, National, Noma, Oakland, Oldsmobile, Overland, Packard, Paige-Detroit, Paterson, Peerless, Pierce-Arrow, Pilot, Premier, R. &

B. Knight, Rauch-Lang, Reo, Rickenbacker, Roamer, Rotary Six, Stanley, Star, Stearns, Stevens, Studebaker, Stutz, Velie, Westcott, Wills Sainte Claire Wyllys-Knight.

UNIQUE BUICK EXHIBITION

USUALLY something original and unexpected proves the dominating feature of the automobile show of the National Automobile Chamber of Commerce, and this year it is a Buick exhibition chassis.

Imagine a perfectly illuminated revolving chassis with every mechanical part in action and visible to the eye. That briefly is what Buick has contributed to the twenty-third annual show which opened at the Grand Central Palace to-day.

It, in itself, literally a masterpiece of engineering, so cleverly and completely worked out that not the least factor is obscured from the vision.

This exhibition is so constructed that all the mechanical parts are motor driven from the chassis' own generator. Current is supplied from storage batteries built integral with the exhibit—the only element not in sight. Power is transmitted to the engine by means of a rotary ring and contact brush. All the wiring is enclosed.

The exterior of the structure and the frame of the chassis are painted a soft brown with an egg shell finish, while the interior cross sectional parts are in special grey. This color combination is pleasingly harmonious. All trimmings are heavily nickeled.

Revolving on its own axis, the structure is easily turned by hand so that close inspection of every unit is permissible. Thus the spectator can look into and note the position and operation of the radiator, cylinders, pistons, pins, rods, bearings, water and oil pumps, and all other reciprocating engine parts; clutch and clutch couplings, control lever mechanism, transmission, universal joint, third member and bearings, differential housing, gearsets and gearset bearings, rear axle, front and rear wheels, steering mechanism and all other operating and stationary parts.

The most remarkable effect this exhibit has upon the spectator lies in the fact that the moving parts keep right on running as the chassis is revolved.

G. E. EXHIBIT AT AUTOMOBILE SHOW

THE exhibit of the General Electric Company at the New York Automobile Show, consists of a large display of Tungar Battery Chargers and of two varieties of noiseless timing gears for automobile engines, the Fabroil gear and the Textoil gear.

An interesting feature of the Tungar Battery Charger exhibit will be a display arranged to show that one type of rectifier will serve equally well to charge the battery on an automobile, the A battery of a radio set, and the B battery of a radio set. The display will consist of one 2 ampere, 60 ampere hour battery, one 5 ampere, 80 ampere hour battery and one B battery, each actually being charged by a Tungar Battery charger, of the type

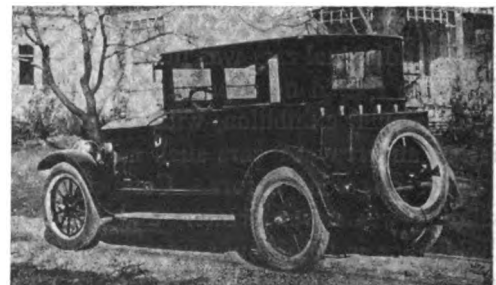
used with automobile batteries. Two meters have been attached to each battery, one to show the cost per hour of charging and the other the charging rate.

In connection with this display, a new attachment for Tungars, known as the B battery attachment will be shown. This device consists of a small resistance tube in a sheet steel enclosing case that can readily be attached to the side of the Tungar case, and as easily removed. The resistance is connected in series with the higher tap on the Tungar transformer and its function is to boost the voltage, and reduce the current of charging. With this attachment a small Tungar will charge either a 48 volt battery at 0.1 ampere or a 24 volt battery at 0.2 ampere. There will also be an exhibit of Tungar Battery Chargers of the types used in public garages and battery service stations.

The exhibit of noiseless gears will consist of two automobile engines, one equipped with a Fabroil timing gear, and the other with a Texoil timing gear. The object of the display is to bring out the noiseless characteristic of these gears in actual operation. The Fabroil gear is made of compressed cotton fibre, oil treated, and held between steel shrouds. The Texoil gear is made of treated canvas fabric, greatly compressed and without shrouds.

AUBURN NEW TWO-DOOR BROUGHAM

The new Auburn two-door Brougham embodies many popular features for closed cars for this year. Perhaps the most noticeable item in the appearance of the car is its lowness to the ground and yet its ample head room. Full cushioned individual front seats—passenger seat hinged to tilting forward, allowing freedom of passage to rear seat. Large trunk carried on trunk rack at rear of car. Polished aluminum bars protect body. Overlapping windshield—wind and rain proof. All metal visor—dull finish underneath to obviate glare. Extra

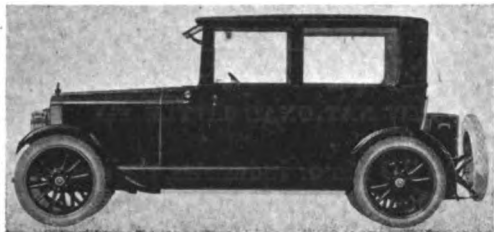


rubber bumpers on doors to prevent rattle. Doors exceptionally quiet. 28 in. windows, 22 square feet of open vision area. Worm and nut window lifters, positive in action holding the glass at any height desired. Body of heavy gauge metal panels with soft, non-rumble top. Cowl ventilator. Standard colors—brilliant blue, maroon and auburn grey with fenders and flashings of black enamel.

NEW ELCAR MODELS

THE new Elcar line comprises both four and six cylinder models. The models exhibited at the show clearly reflect the experience and skill of the new factory personnel headed by F. B. Sears, president of the company. Highest engineering standards have governed the designing of the 1923 new Elcar. Fully abreast of every advance in motor car construction the new Elcar evidences the company's policy to build only a high-grade product at a most reasonable price.

The Elcar Six models are as follows: Five passenger phaeton and speedway sport, three passenger roadster, five passenger sedan and brougham.



The 8-R Red Seal Continental Motor is used in the Elcar six. The chief features of this motor have been highly developed through years of experiment and performance. The result is a motor of utmost simplicity, of increased sturdiness, of easy adjustment, and one that operates successfully on low or widely varying grades of fuel. This motor as installed by Elcar engineers gets all the power out of all grades of fuel and gives quiet, sustained power at all speeds from two to sixty miles an hour.

The Elcar Fours are available in the following models: Five passenger touring, sedan and sport car. The Lycoming-Elcar motor is used. This motor is designed to insure economy of operation, low upkeep, and thorough dependableness, and with the further idea of eliminating the shortcomings of existing types of motors, particularly as regards vibration.

THE NEW LOCOMOBILE

THE new Locomobile chassis, the Series 8, is shown at the National Automobile show at the Grand Central Palace, New York, Jan. 6th to 13th. In view of the recent re-organization of the Locomobile plant as a Durant enterprise, the new chassis has been awaited with more than ordinary interest, for this will be the first opportunity of the general public to look into the Locomobile as a Durant product.

Perhaps the most notable change is the adoption of a special form of battery ignition, a Delco dual system designed especially for the Locomobile, to supplant the magneto ignition long identified with this car. This is explained as a step towards greater dependability; incidentally it is credited with producing increased power, greater flexibility and quiet. The system is two spark, with two independent units, each with its own coil, breaker and distributor.

Fundamentally the chassis remains unchanged, with large powerful six cylinder low speed motor with rated horse power of 48.6, and an actual horse power of approximately 100; its cylinders cast in pairs, bronze crank case, rear construction of familiar design with radius rods, torque arm, double brake drum and full floating rear axle.

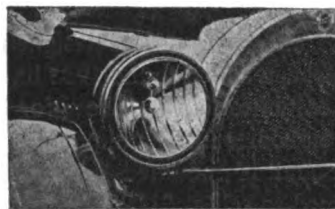
The clutch is new, distinctly a Locomobile development, in which direct engagement is made from the clutch drum to the asbestos compound driven discs, without the conventional intermediaries of metal. This is possible through the meshing of a great number of stub teeth none of which is called on to carry more than ten ounces under full engine load. It operates very quietly under all conditions, and with great ease.

Dependability, as well as economy, is reflected in the hot water jacketed manifold. Carburetion is aided also by further refinements of the carburetor adjustments. The Locomobile display for the National show includes besides the polished chassis, four complete cars.

NEW OLDS HEADLIGHT

THE Olds Motor Works of Lansing, Michigan, is the first automobile manufacturer in the country to adopt an entirely new style of headlight reflectors and glass, so designed that no special lenses are necessary to comply with state laws.

Standard equipment on all Oldsmobile cars will in the future consist of a headlight reflector so corrugated that the light beams are thrown directly down to the road level without the aid of special lenses. The glass in the headlights will be plain window glass, which can be replaced



by an owner at any time with a very small outlay.

The engineers assert that not only will the new reflector result in a great saving to the car owner but it will also greatly increase the efficiency of the light as the plain glass will not diffuse the light rays and they can be transmitted directly to the road.

This equipment has been passed by the highway departments of every state in the Union and many letters of praise have reached the Olds company from officials, who assert that the maximum of safety has been devised in the lighting field.

BOSCH EXHIBITING AT COMMODORE HOTEL

FOLLOWING a new policy it established last year, the American Bosch Magneto Corporation will make a private display of its Starting, Lighting and Ignition

apparatus at the Commodore Hotel during the New York Auto Show week. The Corporation believes that engineers, manufacturers, and dealers will appreciate the arrangements made whereby they can study the Bosch instruments and secure desired information without the interruptions which are so common at the Auto Show. These men are especially invited, but the exhibit will be open to the public and anyone who attends will be made welcome at the Bosch show rooms.

The exhibit will be especially interesting this year because there will be shown for the first time several new Bosch units which have just been announced. One of these is a waterproof magneto of a new type for use on 4 and 6 cylinder cars, trucks, tractors, etc. Its improved design and special features make it an instrument of remarkable efficiency and great dependability.

The new "F" type magneto will also be shown, this being a smaller waterproof instrument for use chiefly on motorcycles and stationary engines.

The dealers will be especially interested in a new Bosch Ignition System for Fords which will supplement the more elaborate Bosch-Ford Systems now already in use. It promises to be one of the most popular Ford Accessories of 1923.

There will also be shown for the first time a new line of Bosch Spark Plugs. This will comprise five types, all of improved design, and embodying special features which make them absolutely leak-proof and especially durable. The new Bosch Spark Plug is the result of extensive experiments and careful designing. It has made an absolutely satisfactory and praise-worthy record under the most severe tests.

NEW OLDSMOBILE CAB

A NEW "cab," an enclosed car, designed to seat two persons, has been added to the 1923 line of the Oldsmobile and is on exhibition at the Show for the first time. This new model embodies many unique features in closed car construction and is mounted on the four-cylinder chassis and designed to sell at \$1195. Genuine plate glass windows have been used and roll curtains have been in-



stalled in the back window. Standard equipment in this new model will include transmission lock, cowl ventilator, windshield wiper and visor, dome light, drum headlights, cowl lights and a double windshield, the upper part ventilating. The luggage compartment under the rear deck has a capacity of 12 cu. ft. The compartment back of the front seat has a capacity of 3 cu. ft.

CADILLAC CUT-OPEN CHASSIS

SPECTATORS at the Auto Show are conferring unusual admiration upon the novel cut-open Cadillac Type 61 chassis exhibited for the first time in this city. This is the standard Cadillac chassis, with its framework white enameled, and every part cut away in such a manner that its operation or construction can easily be studied. The chassis is raised on supports and is wired throughout for special interior lighting. The exhibit is the result of months of work in the Cadillac factory, and representatives of the company are present giving talks on the mechanical construction of the Cadillac and answering questions.

NEW NATIONAL LITTLE SIX

ASSOCIATED Motor Industries, the merger of automotive plants in seven states, announced last summer, has changed its name to National Motors Corporation. The action was taken December 29 at a stockholders' meeting in Chicago. It was stated that the change was made for business reasons, in order that the cars produced and the corporation might have the same name. Chicago will be the future headquarters of the corporation, which has assets in excess of \$20,000,000.

A new little six is the surprise sprung by National Motors Corporation at the New York and Chicago shows. The National little six has 112 inch wheel-base, body designed by H. F. Holbrook, 35 horsepower six cylinder motor, full elliptic springs, standard selective type transmission and full equipment. The five passenger phaeton sells for \$795. All the cars made by National Motors Corporation are National cars carrying out the developments of the twenty-three years' record of the original National automobile which has been represented in every national automobile show in America.

All the National cars this year have bodies designed by H. F. Holbrook in smart new low hung effect in streamline design with high narrow radiators and smooth unbroken panels.

NEW 1923 HAYNES STANDARD SEDAN

THE Haynes Automobile Company, Kokomo, Indiana, has announced the new 1923 Haynes 55 five-passenger Standard Sedan. The Sedan carries two smart-looking trunks, one on each running board, at the front. The new Standard Sedan is equipped with full crown fenders, and full-length running boards with ornamental scuff plates. The radiator is nickel-plated, surmounted by a handsome radiator bar cap and Boyce motometer. A new instrument board on which all the essential controls are grouped into a more efficient space, a gasoline gauge on the instrument board and a tire carrier at the rear are among the other features. Wooden

wheels or Harvey disc wheels are standard equipment. This new Sedan is built on a sturdy and rugged 121-inch wheel base chassis and is powered by the famous Haynes-built six cylinder 55 motor, affording a wide driving range and a satisfying dependability.



Duesenberg 4 Passenger with Straight Eight Motor

FOUR MAKERS EXHIBIT NEW SIXES

FOUR well-known makes of cars formerly limited to the four-cylinder motor, appear this year for the first time with a complete line of six-cylinder models. They are the Stutz, H. C. S., Mercer and Dort. These new sizes are all worthy of study and artistic taste has been shown in the various body designs.

The new Lafayette vestibule sedan for seven passengers at the show has a body designed by Brewster. The upholstery of the open model—the seven passenger touring car and the four-passenger torpedo—is of the pillow type and has no tufts or pleats to collect dust and dirt. The trunk rack at the back of the torpedo is built integral with the chassis and the carrier is fitted with two suitcases.

A five-passenger De Luxe phaeton and a seven-passenger car of the same style embodying the latest features of automobile design and engineering are the most recent models of the Mitchell Motors Company.

Standard equipment on the new Paige models now shown for the first time include two spare tires, bumpers, motometer, automatic, windshield wiper, gasoline gauge on dash, snubbers and electric cigar lighter.

Two new models have been added to the Packard single-six line. One is a five-passenger sedan-limousine and the other a five-passenger coupé. Both are built on the standard chassis of 126-inch wheelbase. The upholstery is gray broadcloth.

The new Buick exhibition chassis is, perhaps, the most interesting feature in the Buick car booth. All mechanical parts are motor-driven from the generator. Current is supplied from storage batteries built integral with the exhibit, the only element not in sight. Power is transmitted to the engine by means of a rotary ring and contact brush. All the wiring is enclosed. The exterior and frame of the chassis are painted a soft brown with an eggshell finish, while the interior-cross sectional parts are in special gray. All trimmings are nickered.

The Willys-Knight exhibit contains a new model, a coupé sedan, finished in blue and upholstered in blue-gray broadcloth. It accommodates five persons.

The 1923 Overland cars present new and very distinctive body designs. The radiator has been raised one and a half inches and is assembled with the shell in one unit. The cowl and hood have been raised a like height, giving the stream-line appearance. The same distinctive hood catches that have been used on the five-passenger Willys-Knight cars are standard equipment of the new Overland.

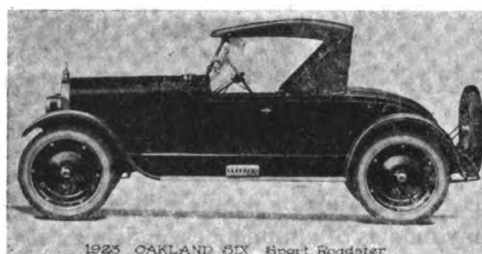
Owners of Stutz cars will be interested in viewing the new six-cylinder models shown for the first time with the old established four-cylinder types. The new sixes are shown in a five-passenger sedan, the addition of closed models being another Stutz departure.

The utility of a small car and the comfort of a sedan are combined in the new Peerless five-passenger town sedan. The front seat, as well as the rear seat, extends the full width of the car, and the entrance is at either side of the front or rear seats through one of four doors. A trunk is also standard equipment.

Among the Dort cars are attractive sport models on the four and the new six cylinder chassis. Both are finished in light blue, upholstered in Spanish leather and equipped with drum-type headlights, cowl lights, combination stop and tail light, spotlight front bumper, windshield cleaner, side wings and motometer with key-locking device.

The Gardner cars on exhibition have many new features, the most notable of which is the five bearing crank shaft, which eliminates vibration in speeds ranging up to sixty miles an hour.

Dodge Brothers' all-steel sedan is especially constructed for shopping. It is an easy car to handle and to park in city traffic. The doors are unusually wide and all windows and doors can be locked, protecting packages left in the car.



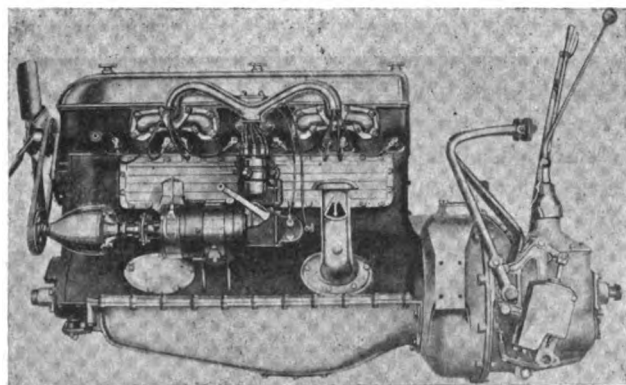
The new Nash six-cylinder four-door coupé presents a rich and roomy appearance. The body is finished in maroon, with running gears and fenders toned deep black. Five disk wheels are standard equipment. At the rear is a trunk. Nickered bars guard the rear of the body and the trunk, so that additional luggage may be strapped on.

The New Kissel six-cylinder motor has a large crankshaft dynamically and statically balanced, giving a large bearing surface in both the main and connecting rod bearings, resulting in great rigidity, acceleration and smoothness. It is said that road tests show that the car will accelerate from five to sixty miles an hour in thirty seconds without the usual vibration between these speeds.

The H. C. S. cars designed by Harry C. Stutz, join the six-cylinder ranks this year, although the four-cylinder

models will be retained. The new type is displayed in a touring car model and a stripped chassis. In the new engine have been incorporated certain features of the best foreign cars.

What is said to be the finest display job ever turned out by engineers of Earl Motors is the white and nickel Earl chassis at the show. From shining front bumper to the polished rim of the spare tire at the rear, not a single detail has been missed. The hood and cowl are nicked and have large transparent celluloid windows which enable the visitor to examine the engine and its appurtenances. The engine block is white enameled, but spark plugs, bolt heads, starting motor, fly wheel, generator, vacuum tank and horn are all nicked and highly polished.



Intake Side of Duesenberg Eight in Line Motor

R. E. Olds First Builder of Autos on a Commercial Basis

WHILE thousands of people will this year view the many models of automobiles on display at the show, ranging in price from a few hundred dollars to thousands, there are few indeed who realize that actual credit for the advancement of the automobile industry to its present stage must go to the Olds Motor Works, of Lansing, Michigan.

For the Oldsmobile enters 1923 in its 26th year and known throughout the industry as the first successful maker of automobiles on a commercial basis.

From the company founded in 1897 by Ransom E. Olds of Lansing, Michigan, came a gigantic industry, in the early period of the present century, which resulted in the foundation of other large companies.

Back in 1895 both Olds and Frank Clark, young men in the employ of their fathers, had a vision of the future automobile. Against the wishes of their fathers, they spent a major portion of their time in a shed in Lansing perfecting their work.

Olds, whose father made gas engines, furnished the engine and mechanical work, and Clark, whose father was a builder of buggies, furnished the carriage and body work for the car which they had undertaken to build. After two years spent in experiments, Olds Motor Vehicle Company, of Lansing, was incorporated with Ransom Olds as president.

In 1898 they finished their first automobile. Today it is housed in the Smithsonian Institution in Washington.

Shortly after this, Clark sold his stock to Olds, who went to Detroit for more capital, while continuing operation in his old plant in Lansing.

On May 8, 1899, the name of the firm was changed to the Olds Motor Works, and a recapitalization was effected.

In Detroit Olds established a second factory and started a business which made the Michigan city the center of vast development of the auto world. He was backed in this venture by S. L. Smith, a Michigan copper king.

The Oldsmobile company immediately plunged into a production program which even today stands as a great figure. In 1900 the company produced 1400 cars. In 1901 they produced 2500 cars and these were sold to celebrities all over the world. Sir Thomas Lipton, the British yachtsman and the queens of England and Italy were among those who bought these first cars.

In 1903 the Oldsmobile created a sensation when the "Pirate" given by H. T. Thomas, then associate engineer of Olds, broke the world's speed record at Daytona Beach, Fla. In the same year the car won the Tour de France.

What the influence of the Oldsmobile on industry was can be realized when it is pointed out that at that time no other American concern was building cars commercially.

Today the biggest concerns of the country, including Ford, Dodge and Cadillac, owe their existence to orders placed by the Olds Motor Works for parts in various companies in which the moving spirits of these later concerns were interested.



Oldsmobile 8-Cylinder Super Sport

So rapidly did the work progress that in 1905 the Olds factory produced the first two cylinder car and in 1906 the factory was able to offer the public the first medium-priced four cylinder car ever produced. It was shown at the New York Auto Show and created a sensation. At that time the company had among its executives many of the leading figures in the automobile world of today.

In 1910 the company was acquired by the General Motors Corporation of which it is an important division.

The Turning Lathe in the Repair Shop

The Man Who Knows How to Use His Machine Can Turn Out a Surprising Number of Different Jobs

BY F. J. SPANGE

THE thread cutting tool used on a lathe for the purpose of actually cutting out the groove is shaped to the exact outline and fills the whole of the groove. This is the general rule, and is probably departed from only now and then. Perhaps in cutting a big groove, some difference will be made. But, generally, the lathe operator is to remember that the nose of the tool is to be the exact shape of the groove and should fill the whole of it, from side to side, at all times.

The cutting edge is to be set exactly at the level of the axis of the screw. This is a most important matter. If set above or below the axis, the resulting thread will be wrong. When drawings are made and specifications are given, the shape and dimensions are those which the thread or groove has at the level of the axis. In fact, the drawing and measurements are exactly those that would appear if the finished screw were split along the axis of the metal article.

For example, if the thread is said to be $1/16$ inch ($= .0625$ inch) deep, the measurement is to be made on a section through the axis and in a perpendicular direction to it.

When the finished screw is still on the lathe, a section through the axis parallel to the floor gives everything just right.

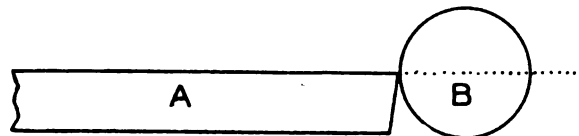
There are two big classes of screws—(1) Wood screws and (2) machine screws. Wood screws are metal screws used in wood. Ordinarily they taper, the threads are sharp and narrow and wide apart, while the grooves are broad and flat next the axis. They are very different from machine screws, and are usually made by machinery. When the repair man needs a screw of this kind, the hardware store is the place to get it. When he uses it, he makes a hole with a gimlet of the proper size—not larger than the core of the screw—and goes ahead. A machine screw, on the other hand, is not tapered. Thread and groove are exactly alike or the difference is small. They may have to be made to fit a hole and thread already existent. And a good snug fit is the proper thing. The repair man may have to make it for the reason that he can not obtain a ready made screw that really fits. The size may be more or less unusual. And besides, the number of threads per inch may also be unusual for the diameter.

In the United States, agreements have been reached with respect to the standards for ordinary machine screws and also for automobile machine screws. These standards

specify the number of threads per inch that should be used in making a screw of a given diameter. This number will differ, generally, between ordinary machine screws and automobile screws. Thus, the thread corresponding to a given diameter will usually be finer for an automobile screw than for an ordinary one. The standards also specify the shape of the thread and its depth for each size of diameter.

Foreign made automobiles are likely to have screw threads that conform to standards in the country where the machine was built or may perhaps be of an odd shape and size. There has been some effort made, I understand, to secure a degree of uniformity. But, I scarcely think a repair man can rely on this. In fact, he may have a car brought to him where the threads are measured in millimeters and centimeters. That is, there will be so many threads to the millimeter or centimeter.

Let me explain this matter a little. Suppose the thread on the foreign screw is cut 2 to the centimeter. A centimeter is 0.3937 inch, so that the width of one thread next the axis is one-half of this. This is 0.1969 inch. How many of these are there to an inch? We find out by dividing 0.1969 into 1 inch. We get 5.08. That is, there would be something over 5 threads to the inch. Our standards would not cover a case like this. We might have 5 threads to the inch, or 6 threads to the inch, or even $5\frac{1}{2}$ threads to the inch, but we certainly would not have such a specification as 5.08 threads to the inch.



What is the repair man to do? Well, that depends. He may have a gear or two belonging to his lathe which have been supplied for the express purpose of enabling him to cut threads based on the metric system. These may help him out. I can scarcely assure him, however, that even with a few special gears he will be able to cut any and every French screw that may be required. But, he will be better off with the special gears, although they may not help him out every time.

The trouble centers really in the lead screw. This is, in the United States and England, naturally made with so many threads to the inch, and not so many to the centimeter. If the repair man has a great deal of for-

eign repair work to do, it may pay him to have a special lead screw. For ordinary cases, the special gears are probably the more economical. The only trouble is to have enough of them to cover all cases. I may have opportunity to return to this matter and explain further about the special gears used for the purpose of cutting French threads on an American lathe.

It has already been said that the nose of the tool fills the groove being cut. The operator attends only to one feed, after the gears have been chosen and put in place. He has nothing to do with the movement of the tool towards the head of the machine. The only feed he attends to is that across the work. He feeds the tool towards the axis.

With this feed, a good deal of care is exercised. It may be managed by hand or under the control of the slide carrying the tool post. If the cutting is to be done by hand with only a *tool rest*, the operator is to remember that the tool must make no movements except in and out. He must not push or direct the tool towards the head of the lathe, but should hold the tool firmly on the rest, not allowing it any movement except in a line perpendicular to the axis of the work. In short, he is to reinstate what is done with the slide, when hand management is dispensed with.

Whatever feed into the work the operator makes, he is to make at the beginning of each cut. The screw is to have the same diameter everywhere; so it will not be permissible to keep feeding the tool inwards as the cut is made from one end of the thread to the other. At the very beginning, then, of a cut, the operator feeds the tool in the proper amount, and then does no more. Nor, does he allow the tool to come back towards him. The tool is held absolutely fixed until the carriage has taken it from one end of the thread to the other.

When the tool post is used and the slide which enables the operator to feed directly towards the work by means of a hand-wheel, the tool is to be so fixed in the tool post as to direct the nose squarely towards the axis. The slide is to be so arranged that the in and out movements of the tool post will also be in this same direction. The hand-wheel is operated at the very beginning of each cut and at no other time.

Attention has already been called to the requirement that the cutting edge shall be exactly at the level of the axis. This is one of the most important matters connected with thread cutting. The operator can not be too careful as to this point. The idea is to make the cut at the precise level mentioned. The arrangement of the tool in the post should be such as to guarantee that the cut will be made thus.

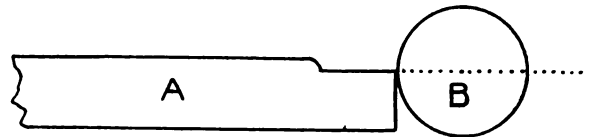
If, under some unusual conditions, the tool can not be fed horizontally, and has to be fed from above or from some other unusual direction, then the top of the cutting edge should be exactly in the same plane with the axis and nowhere else. And the feeding in should be such as to keep it always in this plane.

The easiest way to accomplish all this is to have the top edge of the cutting edge always at the same level as

the axis. It would be rather difficult to do what is required, if the tool has to be fed from above or from below. It can be done, but let the repair man hope that he will not be up against a job requiring it.

Let me warn the reader that it will be very easy to set the tool in the tool post at too high a level or at too low a one. Pieces of metal may have to be inserted in the opening of the post just underneath the tool. Whatever has to be done, let it be done and done with care. The tool is also to be exactly level—or rather, the top of the cutting edge is to be precisely level.

Perhaps the best way to do is to make the cutting tool out of bar steel and to have the top of the shank in line with the top of the cutting edge. That is, let the top of the tool from cutting edge back to the end be one flat surface. When this tool is in the tool-post, it ought to be easy to keep it level and at just the proper height. Use a spirit level, if necessary to make sure that the tool is level.



However, this arrangement of a single flat surface from the nose back to the end may not last long. The cutting edge will naturally wear. It will probably be best to shape the front at the very beginning in such way that, when the grinding on top of the nose is done, the shape and size will be just right. If things are managed thus, and the grinding done on top, then it will be practically impossible to keep the top of the tool, shank and all, as a single surface. Under these conditions, however, the operator can still grind the top so that the new surface will be exactly parallel with the top of the shank.

There is, however, another way of handling things. The top may be kept a single surface and the grinding done at the front—up or down the nose. When this method is adopted, it will be necessary to *shape* the cutting edge at each grinding. A gage should be kept for the purpose.

In making the cuts, the operator should not take too deep a cut at the beginning. This will locate the thread. The next cut may be a fairly generous one. When the thread is nearly deep enough the final one, two or three cuts may be made very light. In fact, it is probably much better, in the majority of cases, to make *all* the cuts light ones. A light cut is very advantageous as compared with a heavy one. (1) It does not press much against the stock and so tend to push it out of line. Chattering should be less with a firm light cut. (2) The tool itself can be more rigid if only a thin chip is to be removed.

A sharp tool is a good thing. Accordingly, the workman will do well not to let too much work be done between grindings.

When the grinding is done, there should be a good deal

of care given in order to produce smooth, flat surfaces on the business end of the tool.

As to lubrication—it is a good thing to lubricate the work right at the point where the cut is being made or a little back of the cutting edge. Water may be used, or a thin oil. A small stream flowing onto the work all the time is a good thing. However, the work on most jobs can be done dry.

The metal in the work, particularly if it is steel, should be prepared by giving it a heat treatment in advance of putting it on the lathe. That is, the steel should be *annealed*. If properly done, this will remove hard spots and make the metal easier to cut and manage.

When the screw thread has been properly cut, it is sometimes advisable to harden the outside shell to prevent the thread from wearing too rapidly.

The reader may expect a number of these matters to be treated with more or less detail in future articles. As to the last matter, the articles that have been running in the columns of *AUTOMOBILE DEALER AND REPAIRER* and which deal with *Case Hardening* will probably give sufficient information to enable the reader to case harden screws. Only a thin skin of hard steel is wanted.

National Automobile Dealers Association Sixth Annual Convention Chicago, January 27 -- 30, Inc.

BUSINESS administration and other subjects of exceptional interest to automobile business men will comprise the program for the 1923 sixth annual convention of the National Automobile Dealers' Association in Chicago, January 27 to 30 inclusive. Through the year 1922 the National Automobile Dealers' Association has had a corps of field men developing the ONE OF A THOUSAND program.

These field men have covered the entire United States in a close and thorough campaign that has given them contact with the dealers in a way that has never before been developed by any factory, by the N. A. D. A. or any other agency in the automobile industry. Through this contact the executives of the N. A. D. A. have gathered a vast fund of information. It has provided a clear picture of "What the Automobile Dealer Is Thinking About."

On the basis of the information thus obtained the program of the N. A. D. A. convention has been built. The program for this 1923 meeting will be devoted entirely to the subjects which the automobile dealer has said were his most troublesome problems today. These can be largely classed under four major subjects dealing primarily and directly with merchandising.

It is said that the automobile business in its first ten-year period was in the engineering or mechanical period; its second ten-year period was the production period in which the manufacturers steadily applied themselves to expanding factory capacities and quantity production; the

third ten-year period began about 1920 and is the merchandising period. Two years of the merchandising era have passed and leading manufacturers are beginning to place merchandising men in charge of factory distribution.

Conditions throughout the United States as reflected by the close contact established this year by the N.A.D.A. with the automobile merchants, indicate that 1923 will be a year in which many changes must be made in the methods of merchandising. Some suggestion of these changes will be contained in the program of the January convention.

As in former years, the railroads have made concession to the N. A. D. A. in providing special rates of fare. Certificates for the special rates must be obtained from the St. Louis headquarters of the N. A. D. A. This has been changed this year because of the difference in the membership affiliations caused by the adoption of the ONE OF A THOUSAND program. The membership of the N. A. D. A. embraces practically every state and there are indications that the 1923 convention will be the most largely attended of any in the history of the organization.

Shooting Used Cars with Bow and Arrow

SHOOTING down used car prices, with arrows sprung from sure enough big bows, manipulated by prospective buyers, is the latest sport introduced on "motor row," Los Angeles, by the W-O-P Company, at their used car park at Eleventh and Grand Avenue. A huge target has been erected on the scene, with a fifty-dollar bull's-eye, and the outside circles shrinking away in price as they increase in size—on down to five dollars.

The customer who seeks to obtain a good used car, at a sub-market price, is invited to the archery course, directly across the street from the company's show-room, where, after picking out a car he likes, he lets fly in old-time woodsman style, with bow and arrow. Toeing the archery line, the prospect takes keen delight in pitting his aim against the profit mark of the dealer. If he makes a bull's-eye hit, he saves fifty dollars on the quoted price of the car he has selected. But if his string-arm wavers, or his bow-thumb slips and tips the arrow, he loses the big drop, but still has a chance to save himself something worth shooting for, if he hits any of the other and larger targets.

R. J. Flynn, sales manager of the firm, says: "This novel sales scheme is creating a world of interest among motor car sportsmen, who like nothing better than a chance to try their skill with such old-time munitions of war, especially when it saves them some real money on a good buy in automobiles."

Also, the archery lot, reminiscent of Robin Hood days, attracts a goodly quota of spectators and "fans," which is no mean advertisement in itself. According to the skill or luck of the customer, depends how much reduction he gets on his car. The nearer he comes to the bull's-eye, the less he has to pay. The scheme is a sure-fire business booster.

Headlights Announced As Legal In New York State

The New York State Tax Commission announced on December 2nd the final official list of headlight lenses and devices which will be legal in New York State hereafter. As the result of the study and examination of various suggested devices and following hearings, the list of more than 100, formerly approved, has been reduced to 42.

All lenses and headlight devices heretofore approved by the Tax Commission or the Secretary of State, may be used until May 1st, 1923. After that date it will be illegal to use any device which does not appear on the approved list of the Tax Commission. The additional time in which to make the necessary changes is granted in accordance with the terms of the new "Headlight Law" granting six months for this purpose following the final disapproval of any headlight device.

The lenses and headlight devices now on the approved list of the Tax Commission follow:

Alpheco lens	Legalite M. III
Bausch & Lomb lens (new)	Liberty lens
Benzer lens, improved, type "A"	Liberty lens, type "D"
Brown reflector	MacDonald Optical lens
Clamert lens, style "A"	Macbeth lens, type "D"
Conaphore clear, type "F"	McKee lens, type "M"
Conaphore noviol, type "F"	Miro-Till (formerly known as Wills Sainte Claire headlamp)
Cor-Co-Lite reflector, type "A"	*Monogram light distributor
Dillon, Type "E"	National lens
Dodge Brothers headlamp	Parab-O-Light, type "F. W."
Flat-Lite, type "B"	Patterson lens
Flintex, type "B"	Primolite lens
Ford refracting prim headlight, type "H"	Right lens
Fracto-Lite	Saferlite deflector
Green Moon	Shaler roadlighter (new type)
Guide Ray Lens, type "A"	Smith's lens
H-G hocking glass lens	Sunlite lens, type "D."
Holophane lens, No. 855	Superfect lens
Hudson, type "R"	Universal lens
Killglare lens	Violet Ray lens
Lancaster beam control lens, type "A"	Wills Sainte Claire headlamp (or Miro-Till)
Lee Knight lens	

Plain glass lenses may be used on acetylene headlamps equipped with 6-inch clear, bright spherical mirror and burners which consume $\frac{5}{8}$ cubic feet of gas per hour.

* Now used on Overland, Willys-Knight, Maxwell, Chalmers, Durant-Six, Rickenbacker, Lexington, Moon, Grant and Oldsmobile.

Theory and Practice

BY N. G. NEER

THE other day a gentleman remarked to me as he was taking his car to the garage for repairs, "The last time I used this car was 30 days ago. Since then I have not adjusted any part, and I am sure nobody else has. 30 days ago it ran fine. Today it won't run at all. Theoretically, therefore, it should run. Practically, it doesn't run."

Every day, in technical journals, we read the expression, "It is true in theory but negligible in practice," or "Here is where theory and practice cross swords."

Such expressions and talk would lead one to believe

that there is a confliction between theory and practice. There is, however, absolutely no confliction. They do not oppose one another. In reality, they work hand in hand.

It is my aim to prove, right here, that there is no confliction between theory and practice. They do not "cross swords," and I will begin by quoting Prof. Goodman's first paragraph in his "Mechanics Applied to Engineering."

"The province of science is to ascertain truth from sources far and wide, to classify the observations made, and finally to embody the whole in some brief statement or formula. If some branches of truth have been left untouched or unclassified, the formula will represent only a part of the truth; such is the cause of discrepancies between theory and practice."

Goodman admits that there are discrepancies, but he says nothing about confliction. He shows that it is the aim of scientists to "get theory and practice together" just as they should be. If they are not together it is our own fault and ours only—not the fault of either theory or practice.

To make my argument perfectly clear do we say, "Theoretically ten times ten equals one hundred"? Or, do we just say "Ten times ten equals one hundred"? We say the latter, of course, because we KNOW it, but isn't mathematics almost pure theory especially as worked on paper? And isn't mathematics practical at the same time? Do we ever find discrepancies between the theory and practice of mathematics? Never. At least, I never have in my mathematical sphere.

There are few things that embody the researches of science more extensively than does the automobile. It is the realization of thought-theory. As soon as the steam engine was made some theorist said to himself, "Why not put an engine on wheels and let it pull us around?" This first theorist may have tried to make the scheme work and he may have failed, and as a result he may have been scoffed at just as theorists are often scoffed at today whenever they fail to bring theory and practice together successfully. Professor Langley is a good modern example. Mr. Curtiss proved that Langley's theories were very close to our present practice. The principal things that Langley lacked were a light engine and experience in driving. There was confliction between theory and practice in his case. The human factor intervened. Human beings have their limitations.

So, today, we have succeeded in getting theory and practice closer together than ever. The original theory of making a steam engine drive a vehicle has grown wonderfully. But, do you note the increasing complexity of our theories with the perfection of practice? Our practice is not yet perfect and perhaps never will be. Why? Because it is doubtful if our theories will ever be perfected. As Goodman would say, "Some branches of the truth have been left untouched or unclassified and our present automobile therefore represents only a part of the truth."

Hence, in automobile parlance, instead of saying, "It is true in theory but negligible in practice," the correct

way to state it would be, "It is true in theory and it is true in practice but the ill effects, if there are any, are negligible," because, if the theory is correct practice will behave just as theory dictates.

To make the relation clear let us reason in this way; Theoretically, the combined horsepower of the four 10 h. p. cylinders of an automobile engine, neglecting transmission friction, will be 40 horsepower. Practically, we find that the common horsepower of the four 10 h. p. cylinders of an automobile engine, neglecting transmission friction, is 40 horsepower.

Theoretically, knowing that shearing and tensional strength of steel, knowing the horsepower to be transmitted, knowing the speed of the shaft and all other necessary factors, a one inch shaft will safely carry the energy. Practically, also, a one inch shaft *does* carry the energy under conditions as understood.

Theoretically, my engine running at 2000 r. p. m., making correct allowance for tire slippage and tire compression, my car will run 35 miles per hour. Practically my car *does* run 35 miles per hour when the engine rotates 2000 r. p. m.

Theoretically, on a good, unobstructed stretch of road, with breakdowns and stops eliminated, I can make 100 miles in less than three hours. Practically, under those conditions, I *do* make 100 miles in less than three hours.

Such comparisons as these could be easily continued indefinitely to show the very rigid and intimate relationship between theory and practice in all kinds of machines—in everything, in fact. The gentleman I first told about should therefore have said, "The last time I used this car was 30 days ago. Since then I have not adjusted any part, and I am sure nobody else has. 30 days ago it ran fine. Today it won't run at all. Theoretically, therefore, something has gone wrong because it won't work practically." The repair man found that something *did* go wrong: The batteries were short circuited through carelessness and refused to work. They were "dead."

Theory and practice are never at variance. They *must* agree. If they seem to disagree, one is wrong or both are wrong.

The cause of most if not all automobile accidents can usually be traced back to combinations of unsound theory and practice. Capsizing of boats, tires bursting, engine failure, catching fire, and skidding, are common accidents that might be named.

To illustrate in a homely way, let us consider the horses, one named THEORY and the other named PRACTICE. THEORY is hitched, alone, to a heavy load called PROBLEM, but he can't pull it. THEORY, alone, is of but little value if any. PRACTICE, also, fails to pull the load alone. Practice is of no value alone. In fact, practice alone is almost impossible. Hitch THEORY and PRACTICE together, however, and they are more liable to pull PROBLEM out of the mire. Theory and Practice are team mates.

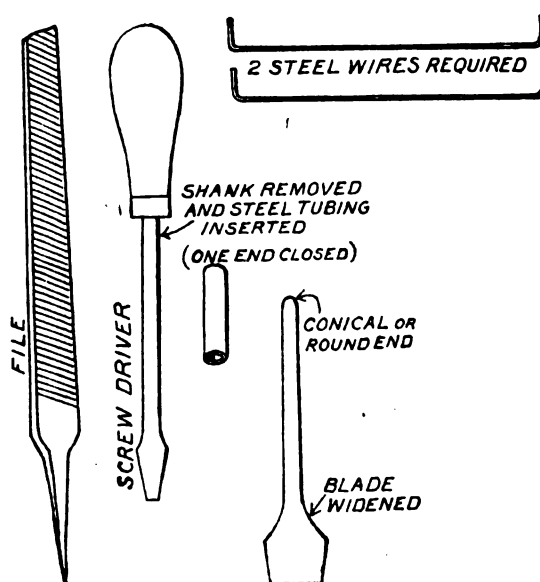
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Idle talk sometimes manages to make somebody busy.

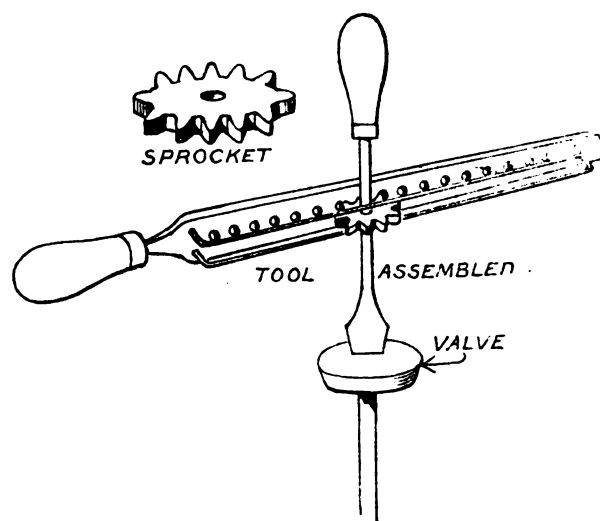
A Simple Valve Grinding Tool

A GOOD valve grinder can be made from an old file, a screwdriver, a small sprocket wheel and two lengths of steel wire. The file is heated and finished off into a smooth strap with the tang still intact. Along the center of the steel, bore holes slightly larger than the teeth of the sprocket, and spaced for them.

At the ends of the file, bore small holes, two at each end, and each side of the row of holes, for the ends of the guide wires. The wires are bent as shown and later when assembled, the wheel is fitted to the gear track and held in place by the wires which ride against the sprocket wheel shaft.



Remove the steel shank of the screwdriver, enlarge the hole slightly in the handle and line with a small steel tube with a closed end. This tubing should fit the end



of the shank, rather loosely and the end of the shank be turned to a conical or round point. The shank is then keyed, soldered or brazed to the sprocket after it has been fitted. The screwdriver blade is widened by heating and made adaptable to the ordinary valve.

In assembling, the shaft is inserted into the wood

handle with plenty of grease lubricant, the teeth of the sprocket fitted to the holes in the file, and the guide wires run past the shaft, and the ends riveted in the holes in the file. The spring of the wire should hold the wheel in mesh at all times, yet not hard enough to cause undue friction. This with the upright handle in the one hand the tang of the file in the other, (with a handle on it) will quickly grind any valve. The work is done by operating the horizontal piece, (file) back and forth.

Movie Story of "Valve-in-Head Motor"

THE story of the Valve-in-Head motor" is the title of a new moving picture film to be presented by the United States Department of Commerce in co-operation with the Buick Motor Company of Flint, Michigan. The photography has been completed and the film will be released early in December.

The Buick film is one of a series designed to show the world how American products are made. The idea originated in the resourceful mind of Secretary of Commerce Herbert Hoover, and has created widespread interest in foreign lands, as well as in this country. The series is catalogued and offered free of charge to universities, clubs, theaters, churches, etcetera, both in the United States and abroad.

"The Story of the Valve-Head Motor" is said by those who witnessed the advance showing, to be one of the most lively and absorbing industrial films produced. It follows the building of the Buick car through the immense plant at Flint, with special emphasis on the construction of the particular type of motor from which it receives its title. Much of the detail is exhibited through what is known as animated photography, which livens the action while neglecting none of the things essential to a complete understanding of the subject.

It is said that no plant in the country is better equipped to show the building of an automobile from the raw material to the finished car. All but the most minor units are built in this two hundred acre plant.

"While the foundries, the various parts factories, the chassis assembly and the body building departments are all portrayed, including the working of some of the most modern machinery in existence, yet the film is so cleverly staged, and the titles so pat, that it never becomes tiresome," says an official of the Buick.

Climbing a hill with spark too far advanced will always cause a knock.

* * * *

Improper valve clearance will cause lack of power.

* * * *

Dust or dirt on the glass or reflector will likely cut down the light on the road about one-half.

* * * *

Oil drips are usually the result of loose cap screws on crankcase.

The United Motors Service Puts Flat Rate Charge In Effect

THE United Motors Service, with general offices in Detroit, has put into effect the flat rate repair service in its 21 branches in the principal cities of the United States and Canada for maintenance repair operation on the electrical equipment it services—Delco and Remy starting, lighting and ignition systems and Klaxon horns.

The maintenance repair at the rates established is available at these branches to any car owner or the trade.

This is undoubtedly the first flat rate service put into effect by any large company, with wide distribution, giving service on motor car electrical equipment.

The electrical equipment of a motor car is a mystery to most automobile drivers and the prices often seem unreasonable because the motoring public understands the electrical equipment on their cars less than any other mechanism.

The schedules of this company are designed to give the customer:

1. A flat rate on his job, which includes both repair charge and material.
2. A uniform price on the same job at any branch.
3. A price based exactly on the condition of his job and the work to be done—not a "general average" of similar jobs done in the past.

J. W. Parry, technical manager, explains that there are two distinct features of the flat rate service of this company which are unique.

"In the first place," he states, "the rate of our service is the same in every section of the country. The usual flat rate system varies in different sections of the country due to the different cost of labor. Our flat rate is the same in every branch whether in the United States or Canada.

"In the second place practically all our major complete unit operations are sub-divided, with charges made separately for each sub-division, with the result that a car owner pays only for just the service he receives."

Before a price on any job is given, an examination of the electrical equipment of the motor vehicle is made, and only after this diagnosis, is the price given. If this examination cannot be made in a short time, the price is later conveyed to the person desiring the repair.

The repair charge given on a complete unit in the schedule always includes minor operations needed.

A man who will not work will work others.

* * *

There is nothing on which it is more important that you economize than on time. Make all your time count, not necessarily by working incessantly, but by not wasting it.

The Forum

This department is for the readers of our magazine. Here you can express your views and opinions on subjects relating to automobile construction, maintenance and repair, driving, etc., and here you can discuss various subjects with other readers.

Letters must be addressed to The Forum, and must be signed with your full name and address, which is not necessarily for publication.

All letters to the Forum will be welcome, but it must be remembered that the Editor assumes no responsibility for the views of readers appearing in these columns.

This month we have some correspondence from an English contemporary, The Garage & Motor Agent, anent the relative value of wood and metal wheels.

WOOD VS. METAL, VEHICLE WHEELS

Mr. Editor:—In the November issue of this journal, Mr. H. C. Clark states with truth that the wooden wheel is *The* wheel for road vehicles in the United States because there was plenty of hickory timber to be used. He also stated another truth regarding the popularity of wooden wheels, *viz:*—"Large organizations have been set up for the manufacture of this class of wheel, which it does not pay to abandon as long as they can find a market."

So it seems that we are using wooden wheels largely "because our Grandfathers did," and do not care to break away to the more up-to-date metal wheel. Another reason why wooden wheels are still so extensively used is that such wheels can be made or repaired almost anywhere, while a lot of machinery is required to build good metal wheels. True, the properly designed metal wheel is easier to repair than the wooden one. If a good metal wheel becomes bent or otherwise distorted, the blacksmith can straighten it out, while the wooden wheel parts must be replaced.

Two points much discussed in wooden and metal wheels are the relative stiffness and resiliency, which I believe is due almost entirely to design of the wheel, and can be made equal, less or greater in either type of wheel, according to the manner in which wood or metal is arranged and is fastened together. That is:—Wooden wheels can be made equally stiff as metal wheels, and metal wheels can be made as resilient as those built of wood!

During years past, the metal wheel was greatly handicapped for want of some easy and inexpensive method of joining the several parts thereof. Later, this difficulty was entirely removed, and at least three methods are at hand for the metal wheel maker, *viz:*—Electric and oxy-acetylene welding, and the pressure process. Perhaps the latter may be unknown to many smiths and auto-mechanics. Briefly, it consists of cold-welding steel or other metal parts by forcing them together in a specially constructed die-press, under enormous pres-

sure, which causes the pieces of metal to unite with each other almost as though they had been heat-welded. A very common example of this method of joining steel parts may be found in the steel (Fenesta) window sashes found so often in factories of concrete construction.

The making of steel wheels, to compete with wooden wheels, requires very careful designing, and the working out of a tremendous lot of special jigs and tools for each size and type of wheels to be manufactured. Much capital must be invested in making ready the material, the designs, the tools and the processes, before metal wheels will displace those of wood. But this is being slowly accomplished by many manufacturers, and as the supply of good wheel-wood grows less, the metal wheel will be as gradually developed, until, having overcome problems of first-cost and prejudice, the metal wheel will be found universal, and the wooden wheel a relic of "stage coach" days.

But let no smith or auto-mechanic entertain the idea that he can "make a lot of money" by going into the making of metal wheels: for that business, to be profitable, must, as stated above, be very carefully developed, point by point, and every little detail exhaustively worked out, the valuable points elaborated and the indifferent ones carefully eliminated. Manufacturing metal vehicle wheels will pay well in the future, but there is a long, hard and expensive journey before the man or concern who sets out to "break-in" to the manufacture, commercially and successfully, of metal vehicle-wheels.

In the end, however, such ventures will prove profitable, provided the concerns develop correctly designed wheels, and are content to "stick-to-it" until the value of their product is recognized and prejudice is dead and buried, or at least an inmate of hospital, asylum or home for the feeble-minded!

To sum up:—I believe in the metal wheel for vehicles, but it must be built right!

—JAMES LOCKWOOD,
1106 Postal Building, Chicago, Ill.

A wise man worries over a lot of things that a fool never thinks of.

* * *

The few men who get to the top of the ladder of success need good men at the foot of the ladder to steady it.

* * *

A grudge nursed in secret will poison the system of any person.

* * *

Any pessimist will tell you that if you do as you expect to be done by somebody will do you.

* * *

There are more self-unmade men than self-made.

* * *

Some customers do take up more time than they should, but you cannot let them know it without the likelihood of driving them away to stay.

Seen and Heard in Garages

Observations of an Interested Spectator Concerning Some of the Work Turned Out in a Public Garage

BY JAMES F. HOBART, M. E.

TWO new automobile service and repair shops have recently been started within a few miles of the writer's home and the policy and method followed in each of these shops, affected every car-owner and driver—at one time or another—within a radius of fifty miles. The first garage which was started "ready-made" will be described in a very few words. Its owners commenced with a shop full of tools, with every appliance necessary for taking care of the usual run of garage work.

There was a small portable forge, a good drilling machine, a small lathe, a press for mandrels, and no end of small tools, vises, benches etc., including a battery charging unit and a serviceable vulcanizer for tire and inner-tube work. Some attractive printed advertising was put out, the local papers used liberally and in a short time, the rather large garage building was full of cars receiving attention or undergoing repair.

But, in a short time, the new and seemingly prosperous garage was almost deserted. Only a few cars were driven into it, and the same automobile was seldom seen there more than once. The writer began to look around for the reason, and he did not have to look far. A friend told his story of experience in the new garage, which the friend called a

HIT AND MISS SERVICE

The gentleman took his car there to have the crank-case oil changed and thorough all-round greasing done, preparatory to a long trip, while the gentleman did some business around town and waited for his car. At the appointed time, he appeared, was told the car "was all ready," paid the bill—a good one—and drove away.

For fifteen miles, everything went well, but then engine trouble began and soon it was only at very low speed that the car was able to make its way to a cross-roads garage. Investigation showed that the crank-case had been drained of oil, but that not one drop of the two quarts paid for, had been placed therein! Luckily, no lasting harm had been done and the oil-less car was able to proceed after the crank-case had been supplied with oil and the lubricant slowly worked around the pistons.

The above is a single example of the half-hearted manner in which work was done in the new garage, which was soon avoided by every man who had been there once or twice. Even for gas, air and water, cars of the wise ones, were driven past to other places and the new garage owners found themselves almost without business in less than three months after starting off with a rush and a shop full of cars.

A SHANTY GARAGE

Less than three blocks from the "Hit And Miss" garage described above, something was started on a vacant corner lot, which paid from the day of its inception, but which was opposite in everything, to the garage which sold oil which it did not deliver! A mechanic who had been with a repair shop in a neighboring town for some time, succumbed to the "urge" for a shop of his own, and determined to start a "shoe-string garage."—And he did, and made it pay too!

The mechanic had a very little money, a good lot of small tools and a great quantity of "know-how," the latter acquired during years of automobile work. The mechanic had just money enough to secure a lease of the corner lot and to purchase a few necessary supplies and a pile of boards and scantling together with a little hardware and some felt roofing.

All "by his lonesome" he put up a little shack which would shelter two automobiles. He put his tools in a corner, built a bench, a wooden forge, and rigged up a hand blower therefor and used a bit of perforated steam pipe for a tire iron in the forge. A heavy casting from a junk yard did service as an anvil, and a pile of steel from the same source served as a supply of material for forged repairs when necessary.

Within a week after the rough shack had been erected the first car went into it for repairs, the owner was forced to hire an assistant and in less than a month, he was forced to build more hack-room and had earned the money necessary to purchase the material therefor. In three months, the corner lot was purchased, a small payment made down and the erection of a garage of considerable size began back of the shacks which were absorbed as the building reached them, their material being used in the permanent building.

By the time the "Hit And Miss" Garage was looking for customers, half a dozen men were working in the "Shanty" Garage—a shanty no longer—and machine tools, one at a time, had been finding their way into the shop. An up-to-date gasoline dispensing apparatus, with a ten-gallon glass tank was installed in front of the shop and there is a "busy buzz" all the time in the shop where work is turned out—"upon its merits"—and warranted to the limit, if customers require such warranty.

But they don't—those who know the shop and its owner, for each and every piece of work done in that garage is executed by each and every workman exactly as though "it was for himself!" In fact, those are the very words of

the mechanic-owner of the garage. He insists that each bit of work be as carefully and as thoroughly done as though the workman were "doing it for himself!"

It is easy to visualize the futures of the two garages above mentioned and it is to be hoped that each party who owns a garage or who is intending to own one, will take to heart the lessons to be found in the "Hit And Miss" and in the "Shanty" garages!

SETTING UP A CADILLAC CLUTCH

A CADILLAC car, vintage of 1914, with eight speeds, six ahead and two reverse, came into a garage for overhauling of its clutch which, so the car owner stated:—"Had not been looked over for a year of Sundays!" Nothing in particular was the matter with the clutch, save that its operating levers needed some adjustment and the owner desired that the clutch be taken down and thoroughly inspected and cleaned—a wise action.

The clutch had been completely dismantled and thoroughly cleaned and looked over. The leather was in good condition and needed nothing but a little neat's foot oil which was applied evenly over the leather surface. Then came the problem of putting the clutch together again for there was no one to help and the larger piece of the clutch reminded one somewhat of a small millstone, and still more so when the part had to be lifted!

The front end of the car had been jacked up two feet and good blocking placed under the wheels. In this case, four pieces of log were used from the wood pile. The logs were about 16 inches in diameter and four pieces each 12 inches were cut off and placed flatwise upon the floor, two under each forward wheel. This made it easy to work under the car.

PUTTING THE CLUTCH INTO PLACE

A rope was tied to the clutch and passed up into the body of the car. One of the floor boards was put in place to give foothold, the castle nut was screwed loosely upon end of crank shaft, then with a prodigious heave upon the rope, the clutch member was hoisted from the floor and over the end of the engine shaft where the castle nut prevented the clutch from slipping off the shaft.

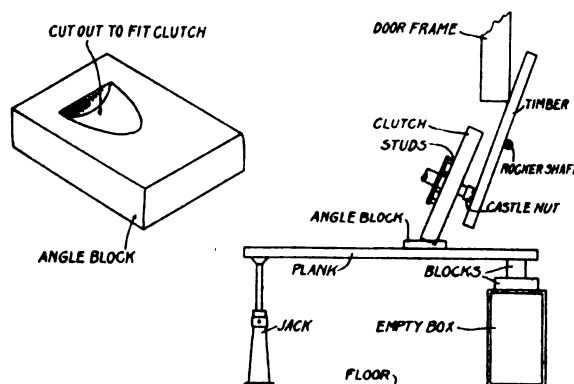
A stick of wood, about four by six inches and five feet long was selected from the wood pile and thrust between the clutch and the rocker-shaft to which the clutch would later be lever-connected. A pry was taken with the stick over the shaft and against the end of the engine shaft and the upper end of the stick was slipped down against the side of the door-space and wedged itself there firmly so it could not be shaken out by any movement of the clutch member.

Tilting the car upon block made the engine shaft stand at an angle and this did not make entering the six stud bolts into their holes in the clutch any easier, for so well fitted are the parts of a Cadillac car that the parts *must* be placed together fair and square, so as to slide together. The least cant or twist of the clutch was found to pre-

vent the entrance into their holes of the six studs which were to hold the clutch-part in place.

AN ANGLE BLOCK

A bit of board, as shown by sketch, was made into an angle block by chiseling into one side a rough hole to receive one edge of the clutch. The block was chiseled until its lower side would lie level when placed underneath the clutch.



The illustration shows the angle block, also how the block was placed underneath the clutch and upon a bit of plank which served as a lever. Blocking was placed under one end of the plank-lever as shown then the jack was rigged under the other end of the plank and a little experimenting with blocking under the air end of the lever and under the jack, enabled the clutch-member to be raised to such a height and angle that it slid easily over the stud-ends. But quite a bit of adjusting was required before this could be done. But finally, the studs were pointed fair into the holes and a smart pull sent the heavy member right into place.

Nuts placed upon a couple of the studs prevented any possibility of the member slipping off again and the lever and blocking were removed, the remaining nuts applied and tightened evenly and regularly, giving each a pull with the wrench until all were screwed home.

Because he "didn't think," there was a bit of sport with a couple of taper dowels which fitted into clutch and flange. Nuts were applied to the dowels back of the flange and screwed tight. Then, while putting nuts upon the studs on the inner side of the clutch, nuts were also placed upon the inner ends of the taper dowels and screwed down. But every time, just as the nuts would be screwed nearly home, the taper dowels would loosen up and turn in the nuts on the back of the flange. After tightening the back nuts a couple of times, it was realized that something was wrong. After a bit of thought, the nuts were removed from the inner ends of the conical studs and the outer nuts tightened and the studs remained tight. The inner threads were only for removing the conical dowels when taking down the clutch; in which case, a couple of the stud-nuts were placed upon the inner ends of the dowels

which were then pulled loose by tightening the inner nuts. And then the writer figuratively "kicked himself" for rank stupidity!

INSERTING CLUTCH COILED SPRINGS

Putting in place the coiled springs which held the conical clutch together, was another bit of work which worried the writer for a few minutes. It was found necessary to compress each spring with a stout lever and to hold them thus until a nut could be put in place. The best place for working a lever seemed on top, while the nuts could only be reached from below, and how was one to be on top and underneath at the same time?

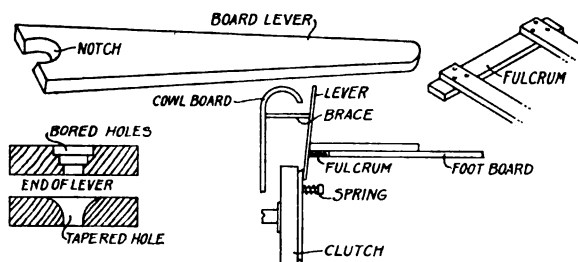
Finally a board lever was made as shown in sketch—and the lever was made just as long as possible and pass under the cowl-board of the car. About thirty inches was the limit, and after trying to use the lever, another half inch had to be sawed off the upper end to let the lever swing past the edge of the cowl.

COMPRESSING A CLUTCH SPRING

Two little sketches show how the end of the lever was cut away to permit the nut to be turned and still prevent the steel cap over the end of each spring from passing through the slot. First, a hole one-quarter inch deep was bored with an expansion bit set as small as possible with its shortest cutter, then an inch hole another quarter-inch deep was made by the body of the expansion bit. A seven-eighths inch bit was then used until the worm pricked through the lever-board, after which the hole was finished from the other side, thus leaving the finished hole smooth.

A "FOOT-BOARD FULCRUM"

A "fulcrum" was made for the lever to bear against. It was found that with the lever supported about two-and-a-half inches beyond the edge of the foot-board, that the lever would lie in the right place. Therefore a bit of board of that width had two cross pieces nailed on as shown by the sketch and when placed over the edge of the foot-board was found to fill the bill exactly.



To apply a spring, the clutch was revolved until a stud was uppermost, then the spring with its two steel caps placed in position, the lever adjusted and the fulcrum slipped into place and the spring was readily compressed by a pull against the lever. When the end of the stud

came against the steel cap, a bit of juggling was necessary to pass the stud through the hole. Movement was made sideways by swinging the upper end of the lever one way or another, and vertical movement was obtained by placing the foot loosely upon one of the fulcrum cross-pieces, then by pressing down on the lever, the fulcrum hinged against the edge of the foot-board and was held by the foot upon cross-piece from going too far down.

It was the work of only a few seconds to "juggle" the spring around until the stud entered the hole in the steel cap. Then an extra push was given the top end of the lever and a bit of wood slipped in for a brace as shown by the engraving. It was found that the brace needed to be just ten inches long to hold the lever in the right position for slipping a nut upon the stud.

One Minute, Please

If it were true, as some business men seem to think, that salesmanship is composed of ninety-nine per cent talk, then a phonograph would be the greatest salesman in the world.

Whatever you are selling, services, goods, your house and lot, a life insurance policy, let the victim do a little talking. In that way you will learn what he wants, and therefore, what features to bring to the front, what advantages to present most forcibly. You will make him feel that he is getting his own way instead of having something crowded upon him.

Many of the greatest actors have been known in the profession as remarkable listeners. That is, they were able to throw into their actions when another was speaking, a force that got their part over even better than when they themselves were speaking.

It is a wonderful thing to be able to listen and to know when not to talk. To know what to say and when to say it, is important for the man with something to sell, but it is not less important to know what not to say and when not to say it.

Anybody with a tongue can talk a steady stream, even when he has nothing to say. But it takes brains to keep quiet and let the other fellow talk until he gives himself away or until he gives you the lead you want.

You have listened to me for a minute. Now you can talk.

Frank Farrington.

(All rights reserved)

Give Your Patrons Service

By Dale Van Horn

WHAT does the garageman in a town or city of any size do to maintain his trade? He does everything in his power to be attentive, courteous and tactful with his patrons. If he doesn't, one of his competitors will palm off a piece of the "Good Samaritan Role" and win him, the customer, away.

What does garageman do where he doesn't have much competition in the small town? As a rule he does almost the reverse. Knowing that he has the best of equipment, stock and location, he soon learns to forget the finer points of the business. He soon assumes the defensive rather than the objective and expects you to actually cater to him. Whereas he should be on the jump to serve YOU.

To prove to your satisfaction that this isn't all bunk, let me cite a little incident that happened this afternoon. This incident, trivial though it is, is typical of lots of cases and putting it down will help to alleviate the dull rage burning under my B. V. Dees.

Friends came out from the city to spend the week end with us. About noon the sun broke through the clouds and ran for a touchdown, leaving a perfectly good afternoon for something. We proposed to spend it slipping through rural scenery and straightway we (the male portion of the foursome) sauntered up to the garage (the only one doing livery in town) and sought to secure the conveyance.

After waiting for twenty minutes in the office with no one asking the nature of our wants, we approached the manager and asked for some car service. Just why he picked on us I don't know but he finally wheeled out an ancient affair, though of good lines and appearance if of unknown origin, and proceeded to make ready to shove off. There was a car on the floor of standard make which I knew to be in good running order but our offer to take that was refused.

The owner's line of talk ran something like this: "This car has been overhauled and while it is a little tight it is in dandy working order. What's that? Everything O. K.? It certainly is." Yet priming was necessary, the battery run down and as it later developed there was a generous leak in the gasoline line. That trip was a tragedy. Two miles out the engine died. It was hot. The best speed we could make was about ten miles per hour, even after several chiropractic treatments given the carburetor it did work a little better but we weren't on an overhauling expedition. And all efforts to start the car failed. Luckily friends passed in a Buick, recognized us, backed up and took the ladies home.

The clutch was so loose that by pushing the bus away and then quickly throwing it in would not turn the engine over. Three hours later we got home, lame, a sprained wrist apiece and dark clouds hovering on the mental horizon. We paid for the gas, donated our time to the garage business and have been in a grouchy state all evening. Our day has been spoiled and said friends departed a few minutes ago, probably never to return.

All because we swallowed the sand-bag-garageman's story. He has lost an occasional customer for all time. He probably loses other customers now and then in a similar way. Why don't he wake up to his job and give his patrons service?



Wisdomites

A weak clutch spring can be repaired temporarily by placing washers under it.

* * * *

Nearly nine and half million dollars was paid out by insurance companies last year for motor cars destroyed by fire, due chiefly to carelessness of owners. Do you sell fire extinguishers?

* * * *

A loose front bearing on cam-shaft will cause noisy timing gears. If there is no adjust screw, removing the bushings and copper-plating them will remedy the trouble.

* * * *

The clearance of a piston is allowed at the skirt and it is ground so as to allow approximately .001" clearance for each inch of piston diameter.

* * * *

Reground cylinders fitted with new pistons and rings are said to give the motor as much, if not more power than when new.

* * * *

Rings that do not fit allow leaking of gas, but on the suction stroke air is sucked up from the crankcase, thinning the mixture and causing the engine to skip.

* * * *

Carbon holds heat and if the compression is high it will often explode the mixture earlier than it should.

* * * *

When a ring groove becomes worn to more than .005" clearance the piston can be put in a lathe and the groove widened to take a ring 1/32" oversize.

* * * *

A cadmium test will indicate the condition of the plates without the necessity of opening the cells. It will also indicate whether it is the positive or negative group of plates that is defective.

* * * *

Ammonia immediately applied to acid spilled on cloth or clothing will neutralize the acid and prevent a hole being burned in the material.

* * * *

The diameter and angle of the S. A. E. thread is the same as the U. S. Standard, the only difference being the S. A. E. thread is of finer pitch, or more threads to the inch.

Automobile Dealer and Repairer

A Mechanical Motor Magazine

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M. T. RICHARDSON F. R. WHITTEN
President and Treasurer Secretary
M. T. RICHARDSON, Editor
GEORGE H. WILSON, Managing Editor

F. R. WHITTEN, Advertising Manager
H. F. LUDINGTON GEORGE A. SMITH
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The Ability of the Repair Shop to Serve

After visiting the automobile show at New York and observing the trend of design and construction of the new models of cars, we are more than ever convinced of the fact that the business of the garage and repairman will henceforth prove more a proposition of service than ever before. That is to say, the garage and repairman who looks to the service end of his business is the man who is going to reap the largest share of profitable trade. We use the term service, in its broadest meaning, and it must be remembered that in speaking of service we have in mind the variety of service which is rendered by repair shops and garages throughout the country. Some of the new cars, if they get reasonably careful use, are not likely to require the same amount of repairing and overhauling as some that have gone before. For this reason, therefore, the live wire will recognize the necessity of putting forth every effort to advertise and demonstrate the ability of his shop to render the best of service to the car owner. It means, also, that the man who will succeed is the one who keeps a careful eye on the every day conduct of his business, who adopts methods and practices that have been proved to be profitable. Probably one of the most important details of any repair shop business is the matter of equipment. There is a wide field for improvement in this direction and shop owners should give most careful thought and consideration to

the subject. Modern tools and machines are to be had that will enable small shops to increase the number of jobs turned out, speed up the work, and that will pay for themselves many times over in increased profits.

Shall Tail Light Color for Autos be Changed

There is considerable being written and quite a lot more being said, about the matter of adopting a new color for the tail lights on automobiles. Doubtless much more is yet to be written and said, before any definite action is taken by the powers that be in the automobile law-making world. There seems to be, and we believe there is, a deep rooted desire among motorists for a change. The one point that is stressed by all who have written on the subject, is the fact that the red light has always been considered a stop signal, or the sign of immediate danger. It is claimed that a red danger signal should be a stationary one. This may be so, but it is pointed out that a parked car may properly display a red light and then start off from the curb, and still display the red stop signal. This it is said, confuses the driver of an approaching car who might have been considering the danger signal as locating a pile of dirt, or stone, or some other building material. With all of the talk on the subject, no one seems to be able to suggest a more generally acceptable color. We would like to hear from our readers as to what may be the opinions expressed in their locality. Are you in favor of changing automobile tail light from red to another color, if so, what color and why?

Getting the Other Fellow out of Trouble

While it is gratifying to receive as many requests as we do in our Trouble Department, we are disappointed in nothing that a great many of our correspondents fail to supply information of a character that will enable us to furnish a really instructive answer to their questions. Some are very explicit and others hardly say enough sometimes to make it possible to know just what they are writing about. Our Trouble editor has suggested that we publish some of the questions received, for our readers to answer if they can. He's convinced that if the readers once realize how difficult it is to supply useful information to some of our questioners, who fail to give required details of their troubles, they will reform, and never ask him to help them out of a difficult situation without telling him exactly what the trouble is, as near as they can possibly describe it.

DESCRIPTIVE MUSIC

"What's the name of that piece you were playing?"

"'Bungalow Blues'."

"And what was the prolonged, melancholy strain you repeated at frequent intervals?"

"That represents the installments."

—Rochester Retailer.

Work Shop Experience Prize Contest

Contest Closed December 15—See Announcement of New Contest in this Issue

Following is a list of the Prize Winners in our contest which closed December 15th, 1922:

GENERAL OVERHAULING

Mr. Hugh O'Neil,	1st Prize
Mr. F. B. Hunt,	2nd Prize
Mr. Dean Kerney,	3rd Prize

ELECTRICAL REPAIRS

Mr. Arthur Scott,	1st Prize
Mr. A. R. Joyce,	2nd Prize
Mr. G. A. Luers,	3rd Prize

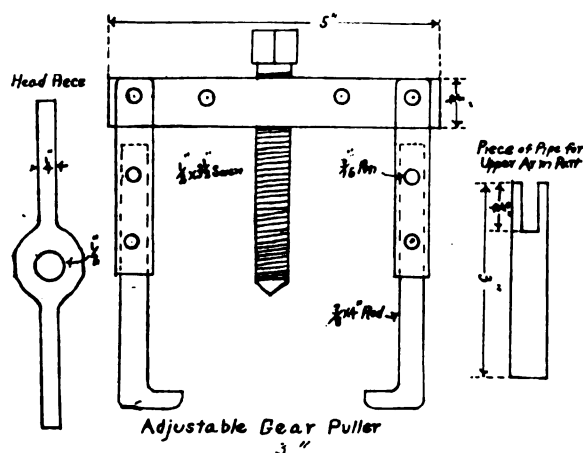
SPECIAL OR HOME-MADE TOOLS

Mr. W. B. Kiler,	1st Prize
Mr. M. Frankel,	2nd Prize
Mr. L. M. White,	3rd Prize

TIRE & TUBE REPAIRS

No prizes were awarded in this group, there being only one entrant for the contest.

ADJUSTABLE GEAR PULLER



The drawing shows a very simple puller, yet one of a size that is very much in demand in the repair shop. Larger ones can be made on the same plan, of course, to fit any particular requirements.

W. B. HILER, Texas.

RIDING HOME ON A BROKEN AXLE

While driving an old Overland car the left axle snapped close to the square end and left me ten miles out on a lonesome road. I thought I was going to break my rule that if they took me there they must bring me back, so I took a few minutes to do some thinking. Here is the answer.

Removing the right axle first, I found it about two inches longer than the left that was broken. I thought if I could lock the differentials I could get home under my own power. By cutting the branch off a tree I pushed the broken piece clear through and that gave me the idea. So I found a cold chisel and hammer and chipped the right axle square about two inches farther and put it in the left side and it went through both differentials and locked them. Being equipped with wire wheels the wheels would not come off with a broken axle but wobbled a little. When I bought a new axle and asked the repair shop owner if I could install it in his place, he wanted to bet me that I did not have a broken one. My new axle cost me nothing and the man said the stunt was worth the price.

GUY WRIGHT, W. Va.

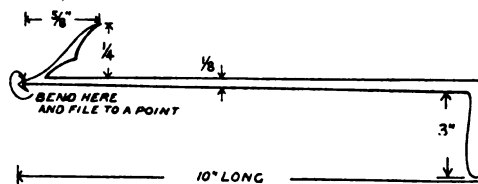
A PUNCTURE IN THE WILDERNESS

Getting a puncture out in the wilderness with no spares and worse yet, with no matches, but plenty of Shaler 5 minute Patches, I was just about giving up hope when a thought came to me to fasten the patch on the tube and put a few drops of gasoline on it. I then took out a spark plug from the engine, turned on switch and the rest was easy.

EDWARD CLUTE, N. Y.

TAKING UP MAIN BEARINGS

In taking up main bearings where the front and rear main are a part of the upper case and protected from oil leaks with wick packing, it is impossible to remove the front main bearing because of the packing holding, with-



out removing the radiator, loosening all the motor bolts of which the front must be removed. Raising the motor out of the frame so that the fan belt pulley will pass the front cross member, and removing the starting crank housing and the timing gear case, where at last you are able to drive the packing out with the aid of a punch. But with the aid of a tool as shown in the drawing, I was able to remove the packing without any of the above

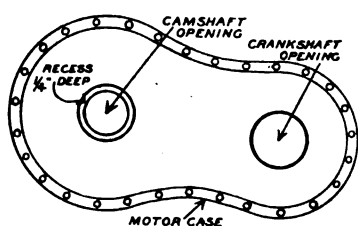
procedure. First drive the hooked end in by the side of the packing about two inches, turn slightly with a pair of pliers so that the hook catches into the packing, and pull out the packing. If care is taken in starting the packing it will hold together and can be removed in one piece by taking hold of it with the fingers and pulling gently. However, if it was broken when it was put in you will have to drive in the tool and fish the remainder out, at which time the bearing can be very easily removed, and the packing can be returned after the bearing has been taken up, with the aid of a punch. This operation takes about ten minutes which is a saving of about three hours over the other way. It will be found very useful for removing steel ball retainers as well.

DEAN KERNEY, Ind.

TAKING OUT A BAD KNOCK

A car came into our garage to have a knock removed, which sounded like a main bearing. But on idling the knock was as loud as before and increased with the speed of the motor. It was torn down for bearing inspection. The rod bearings were found O. K. However, the wrist pins were sloppy and the pistons were fitted with oversize pins. The mains were taken up and blued to a fit as were the rod bearings. The noise was thought to have been in the pins and misalignment of the rods which were lined up.

But as soon as the motor started there was that noise again. I brought into play a sounding post which pointed to the front main again. The motor was torn down again. The crankshaft removed and lined up and found O. K. The flywheel was tight on the crankshaft. The timegears were tight on the cam and crankshafts and not



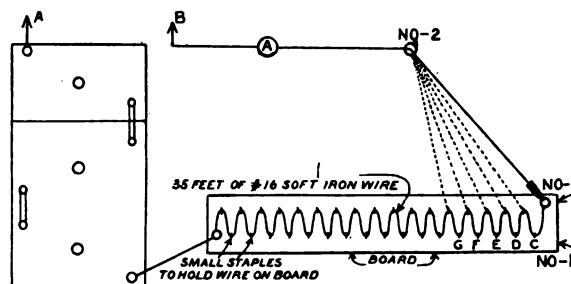
sprung or cracked. The camshaft was lined up and found O. K. But it was also found that the hub of the cam timegear had cut a recess in the motor case to a depth of $\frac{1}{4}$ inch. After some experimenting I found the spiral timegears would throw a backward movement on the camshaft. Pushing it back enough to strike the plunger of the oil pump with the toe of number two exhaust valve, causing some real noise. I turned out a piece of steel to fit snug into the recess, drilled and tapped it, used two flat head machine screws to hold it in place. I dropped a little solder on each screw to prevent them from working loose and built the motor back up. This was a year ago and the car has been running fine ever since.

DEAN KERNEY, Ind.

SETTING CADILLAC RELAY

On a cadillac car, the circuit breaking relay which gave a lot of trouble by vibrating as soon as the switch was turned on, the trouble was overcome by removing from the car and regulating as follows:

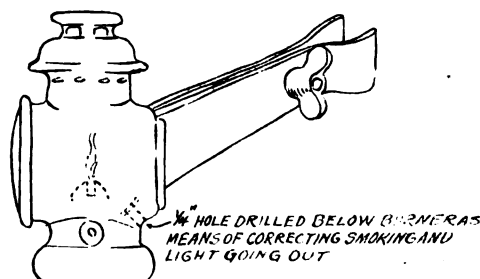
First it will be necessary to take about 35 feet of No. 16 soft iron wire and attach to a board as shown in the drawing. To set the relay at a given point, be sure there is no connection between terminals 1 and 2: connect wires A and B to relay. Next take a test point with a battery clip attached and connect to terminal No. 2; then touch the



test point to terminal No. 1. Watch the ammeter. About 8 or 9 amps will flow. Now touch the test point to the coils of the resistance unit C. D. E. F. and so on. The relay is to be set to break at 15 amps so it will be necessary to stiffen the tension spring on the relay and watch the ammeter until a point on the unit is touched when this amount is flowing. If the relay does not open at 16 amperes the tension spring on the relay should be weakened until the relay just opens at fifteen amps. After adjusting the relay it was returned to the car and worked fine.

DRILLED HOLE CORRECTS TROUBLE IN PARKING LIGHT

As is common with oil burning lights, a trouble which a local owner of an automobile using a small kerosene parking light experienced, was that this invariably smoked and went out on occasions, leaving the car without the signal as required by law. Reasoning that the smoking and quenching of the flame was due to insufficient air, to enable the light to burn properly, the owner drilled a



small quarter inch hole at the rear of the lamp body, just below the burner. In consequence the light stays lighted and smoking is avoided. This is a simple remedy and is worth trying. In the instance where it fails of this purpose, it is simple to place a wood plug or cork in the opening.

G. A. LUERS, Washington, D. C.

THREE GOOD JOBS

The pin that holds fan drive pulley in place on crankshaft of Ford cars used to come out and it was a job making a new one and driving it in, or using one we had.

A good way to overcome this trouble is, drill a small hole in end of shaft, so hole extends into pin hole. Then tap out this drilled hole and put a small set screw into it. Drive pin to its place and tighten set screw. Pin cannot come out.

We were having a lot of trouble with an old casing. We had no new one with us, but we had three old ones along.

I took one of the old ones, cut the head off both sides, then cut it and cut enough off so the two ends would come together inside of the casing on the wheel.

Then I took a thin piece of leather boot and put it across the butt joint of inserted casing. I then put in the tube. Put the whole assembly on to the wheel and pumped her up. I ran that tire one and one-half months without any trouble.

A friend of mine had neglected the differential oiling. So he took rear axle off and found that one of the little pinions had become set on short stub shaft of spider. He tried to dislodge the little pinion but it would not budge. He brought it to me. I said "I might try my hand at it." "I do not think that you can get it off, but you are welcome to try it," he said.

I heated the pinion with a blow torch being careful not to heat stub axle or shaft. I then put the spider in a vise, letting the stub shaft come down between jaws of vise, leaving about one-eighth of an inch space between pinion and jaws. I took a dull cold chisel and held it against teeth of pinion and gave chisel several good blows with a three pound hammer. I then held chisel so as to drive pinion around to left, again striking it. I did this until I loosened it on the shaft. Then I let spider and pinion down so that pinion rested on jaws of vise.

I took a square piece of iron and held it on top of stub shaft and struck some good blows. It finally came out and I then dressed shaft and pinion. Same gave no more trouble after we reassembled same.

J. H. HERMAN, Montana.

FILLING PETCOCK FACILITATES PRIMING VACUUM TANK

A local motorist has an improvement for the vacuum tank of a car which is of advantage for any motorist to make. To avoid the necessity of a wrench to screw out the plug and a funnel to pour the gasoline into the tank, causing delay to obtain these articles, he simply substituted a petcock with a funnel like opening as is used sometimes in engine heads for priming. These are made in quarter inch and three eighth inch pipe tap sizes and consequently no tapping out of the hole is required. To fill, it is only necessary to turn the valve and pour in the gasoline from any available container. This is simple, but a time saver for the busy motorist.

G. A. LUERS, Washington, D. C.

CURES FOR BEARING END PLAY

These sketches show three methods that I have used to take up end play of the engine crank shaft. Fig. 1 is the simplest but requires one to lay out the shim fairly accurate and the removal of sufficient bearing shims to make up its thickness.

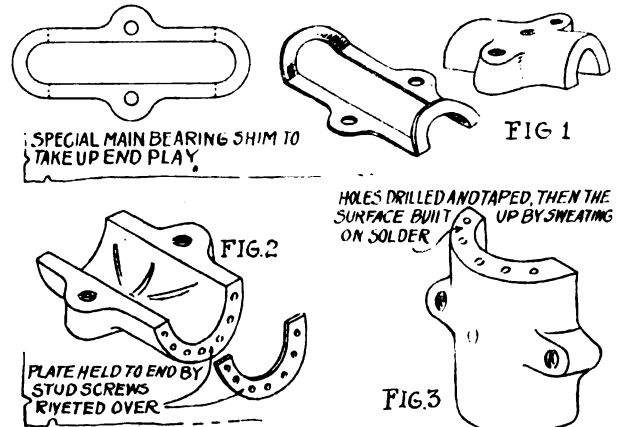
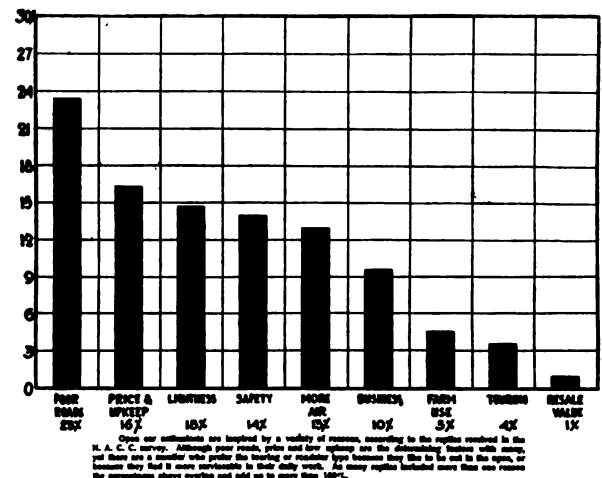


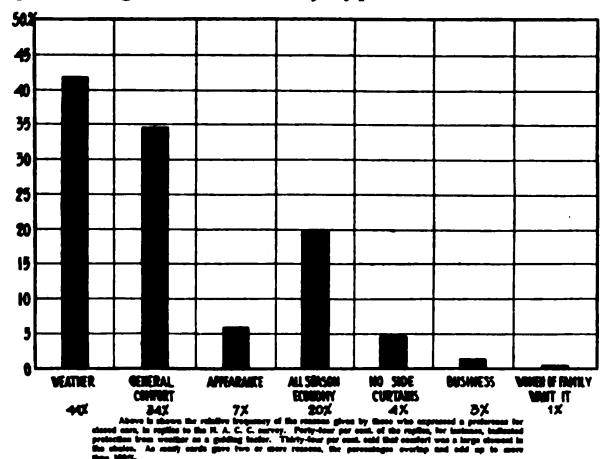
Fig. 2 consists of attaching by means of studs or screws a plate; this is applicable to only bearings with sufficient end surface to permit screws.

Fig. 3 shows how tin solder can be sweated on best by using small holes to anchor the metal.

C. H. WILLEY.



N. A. C. C. Charts—Showing percentage of car owners preferring open touring car models and the reasons given for the preference. The chart below gives the reasons for preferring the closed body type of car.





This department is intended as a "Trouble Clearing House" for our readers. Correspondents are requested to give the fullest information in every case, so that replies may be made intelligently and be of value to others, as well.

All letters will be answered as promptly as possible, but we would remind our readers that some of the information asked for by correspondents is not always "on tap" and if time is required in securing the desired facts a reasonable delay in answers must be expected.

Readers are requested to make criticism and comment or to freely discuss any subject of interest to the automobile mechanic, owner or operator. This is your own department and you can make it just as interesting and valuable as you will.

Wiring diagrams will no longer be printed, but will be furnished by mail when requested.

3161

From F. R. S., West Virginia.—Can I connect my Sampson electric horn to the Bosch high tension magneto?

Reply: We would not recommend you to do this. But if you can devise a way to make the connections the magneto would probably answer the purpose for a time. It should be borne in mind that the magneto was not designed for such use.

3168

From R. L. Powers, Ind.—Can you give me the names of dealers handling solid axles which can be equipped with Ford wheels and platform spring, for trailers, and which can carry 1000 to 1500 pounds?

Reply: Following are the names of some manufacturers of complete trailers, also the names of some who make trailer axles. Possibly such parts as you require make be secured from some of these: Axles:—Continental Axle Co., Edgerton, Wis.; Auto Engineering Co., 1535 Temple Ave., Detroit, Mich.; Superb Mfg. Co., (make to order) Monticello, Ind. Trailers; Warner Mfg. Co., 29 Main St., Beloit, Wis., Troy Wagon Works, Troy, Ohio; Syracuse Mfg. Co., Syracuse, Ind. (2 wheel); Perfection Trailer & Mfg. Co., 1473 W. 110th St., Cleveland, Ohio.

3169

From R. Adair, Ga.—Can you furnish me with the address of the firm making a combination vise which I saw advertised in the A. D. & R. some months ago. I enclose a sketch showing how the apparatus looked as near as I can remember it.

Reply: The combination vise you ask about is manufactured by the Chicago Flexible Shaft Co., 12th St. & Central Ave., Chicago, Ill. It was advertised as the "Stewart Handy Worker" or big Six-In-One-Tool.

3170

From C. W. Dunning, Me.—Will you please give me the address of the people that make the Sears hand punch and shears, and the Little Giant punch and shear?

Reply: The Sears Manufacturing Company, Onslow, Iowa, were the manufacturers of the punch and shears mentioned and so far as we know they are still making them.

3171

From M. R. Sullivan, N. Y.—Will you please send the name of some company that handles apparatus for burning carbon from auto cylinders.

Reply: The apparatus required can be secured from the Linde Air Products Co., 30 East 42nd St., New York City, also from the American Oxygen Co., 2nd & Elm Sts., Cincinnati, Ohio.

3172

From Philip Larsen, New York—Can you give me the name of the publisher of a book called "Motor," in which I saw a list of all cars, their prices, etc.

Reply: The book you mentioned is a monthly magazine and is published by the International Magazine Co., 119 West 40th St., N. Y. City.

3173

From J. P. Gorner, Mass.—Will you please tell me if it is advisable to install a "hunting link" on the timing chain of my Hupmobile Series R, 1920, or would it be better to put on a new chain. Also tell me where to secure the above and the price.

Reply: So far as we know the use of the hunting link has proved quite satisfactory and unless the conditions in your case are of an unusual nature there is no reason why you could not use it with good results. It is made for the purpose of shortening the chain one pitch, or link. Possibly your trouble makes a new chain necessary but as we have insufficient details we are unable to say just what method would prove best for you.

(Note—Owing to the large number of inquiries requiring unusual detail in answering and the fact that we are cramped for space in this issue we are unable to publish as many of the trouble department questions and answers as we would like to print.—Ed.)

The employee who is always afraid he will not get what is coming to him, has just one thing coming to him right and that is a grand bounce.

* * *

A down and outer likes to blame his failure on the town he lives in.

* * *

"Lost Opportunity," remarked the Man on the Car, "always goes around to the back door to knock."

* * *

The best way to get along with contrary or refractory customers is to agree with them or to say nothing. An argument never sends anyone away feeling good.

Facts for the Tire Repair Man

Practical Details Which Should Have The Careful Consideration of Those Who Are Operating Tire Repair Shops

BY F. H. SWEET

TIRE repairing is a highly profitable business for the man who is fully qualified and equipped, and employs expert workmen. The present article describes briefly the opportunities in this business and gives some general information on the construction and repairing of tires. Regardless of the original cost, a tire, to the average automobile owner, is an expense to be seriously considered. Present tire prices have probably not increased in proportion to the prices on other articles—nevertheless, the outlay required for new casings and tubes is sufficient to make it an object for the owner to have them repaired again and again until the last possible mile has been secured.

Everyone who has had experience in tire repair work admits that there are great chances for profit in it. Many repair men are getting these profits; others are postponing their start because they have the impression that tire repairing is a mysterious, difficult art to learn, or that the necessary equipment is exceedingly expensive.

But customers are coming to the front door every day. It is hardly necessary to ask them for their tire repair work. The overhead in an established garage amounts to very little more for the vulcanizing plant. Any ordinary workman can, with practice, learn to do the work and make more profit in the time he spends at it than he could make in many other lines that are generally considered indispensable in the well-regulated garage. This article is written for the retailer of tires, who should know all about them and their repairing, as well as with the idea that it will be helpful both to the garage man who has never undertaken tire repairing, and the repair man who wants to improve the class of his work.

All tire repairing is based upon the property which uncured rubber has of welding itself to cured rubber when the two are held together under pressure while the correct degree of heat is applied. The process is very similar to the welding of metals.

In repairing tubes, then, we literally weld a piece of new rubber into a hole or cut and thereby make a repair that is permanent, as distinguished from patches which are stuck on by means of cement. The apparatus used for tube repairing is simply a flat plate, heated to the proper temperature by steam or electricity. The source of heat has nothing at all to do with the process of vulcanizing, but it is vitally important that the correct temperature be maintained, either by watching and regulating the heat, or in the better class of vulcanizing, by means of automatic control. A safe vulcanizing temperature is 265 degrees F. Higher temperatures vulcanize more quickly, but there is danger of injuring a tube if it is accidentally

left on the vulcanizer too long. 265 F. is about the temperature of steam at 40 pounds, and when a steam vulcanizer is used, the operator generally ascertains the temperature by reading the steam pressure which the gauge indicates.

"MOIST HEAT" A MISNOMER

Moisture is absolutely detrimental to a repair, and there is no such thing as "moist heat," as the heat from a steam vulcanizer is sometimes called by repair men who think that because a vulcanizing plate has steam behind it, the kind of heat is different than if it were produced by electricity, for instance.

Too high a temperature will overcure or burn a tube regardless of whether there is steam in connection with the vulcanizer or not. The correct temperature will vulcanize perfectly, regardless of the heating medium that is used. In vulcanizing tubes, the repair is prepared in one of the ways described later. A piece of wax paper is laid over the repair and the repair placed on the flat tube plate. The waxed paper is merely to keep the sticky new rubber from adhering to the hot vulcanizer. A block of wood of suitable size is next placed over the tube and a clamp applied so as to give a good firm pressure. The tube is left on the vulcanizer for a length of time dependent on the size and thickness of the repair, and when removed and cooled, is ready for use. If repairs are properly prepared, there is no danger of the tube sticking together on the inside, because the inside of the tube is covered with bloom, or free sulphur, that will not incorporate into the repair.

In the case of very large repairs, it is easy to avoid even the possibility of such trouble by placing a piece of paper inside of the tube to prevent the repair from touching the opposite side. The paper can do no harm if left inside. Clean the tube thoroughly with clean high test gasoline and coarse sandpaper, or a rasp, for at least an inch all around the puncture; then wipe off the dust with a cloth or waste moistened with gasoline. The success of all repairs is largely dependent on cleanliness. Commercial gasoline, as sold today, is likely to contain more or less oil, and, consequently, may even hinder a repair from sticking as it ought to. If gasoline that is clean and free from grease cannot be obtained, do the cleaning with sandpaper and let it go at that.

If gasoline is used, let it evaporate and then apply vulcanizing cement to the edges of the hole to cover a space as large as a silver dollar. When this has dried for a few minutes, apply a second coat of cement over the first and let it dry thoroughly.

If the hole is only a very small one, push a little piece of raw rubber into it and then take another piece as large as a quarter and place it over the puncture. Cover with wax paper and put on the vulcanizer for fifteen minutes at a temperature of about 265 degrees F.

Trim the ragged edges of the rubber with shears so as to leave a slit in the tube about a quarter of an inch wide. Wash and clean the tube inside and out for an inch or more around the cut, using clean gasoline. Roughen the cleaned surface with a rasp. Coat with two layers of cement, allowing each to dry separately.

Insert into the hole an inside patch of one-side cured rubber by folding and setting in place with pliers. The uncured side of the patch comes next the hole in the tube, and the cured side prevents the repair from adhering to the opposite side of the tube. Next fill the cavity with strips of raw rubber, pressing each down firmly so that the edges of the raw rubber are stuck to the edges of the tube all the way round. Finally roll the repair lengthwise and crosswise with the stitcher, which is a small toothed wheel that is made to insure all of the repair being firmly united to the tube.

There is practically no limit either in length or area to the size of the repair that can be made by this method, and the finished repair will be as strong as the rest of the tube. If the repair happens to extend partly around the tube, it is prepared all at once, although the vulcanizing process may require two or three settings in order to get all of the repair into contact with the vulcanizer.

The only way to figure whether or not a tire is full value for the money is to consider the number of miles it will run and give good service. For this reason it is obvious that it does not pay to buy a tire recommended only by its cheapness, because it is natural that with the current prices of the best tire fabric that a certain limit is placed upon the manufacturer by the high cost of his materials. The tire in most common use today is the fabric tire, which has a canvass of 17 1-4 ounce duck, close woven; but this construction is gradually being replaced by the cord type, which has several advantages. As a matter of fact, although the cord tires are more expensive, the increased mileage gained by the use of cord tires must be considered in their purchase. Full value for the money is given in the well known makes of tires, whether fabric or cord types are purchased. Where value is not given, however, is in the tires which are made up of shoddy material for fabric and have too large a percentage of reclaimed or scrap rubber.

BEST QUALITY RUBBER USED FOR TIRES

The very best quality of rubber must be used for tires. You can easily find this out for yourself by getting quotations of the scrap buyers on the scrap from different sources. The scrap from the rubber tire is always valued much higher than other scrap rubber.

However, the scrap from a tire would not be suitable to make the next set of rubber tires. That is, each time the rubber is cured it goes down grade until finally it ends in such condition as the rubber used for overshoes. This

rubber has not the toughness or elasticity required for tire use, and would soon wear away under the hard stresses imposed upon it by traveling over the roads. Not only does the rubber wear away quickly on the tire which is built particularly for cheapness, and the fabric go to pieces because it has not the strength of the high quality product required, but the tires themselves, through their higher rolling resistance, use the power of the engine. In other words, with good tires you get more miles to the gallon of gasoline than you do with poor tires. This last has been proven over and over again. The reason for the loss in power is due to the internal friction in the tire. This causes some of the energy to be wasted in the form of heat, and naturally the heat itself does not do anything to prolong the life of the tire.

A tire which has not been as carefully made as it might be has more internal friction, due to the lack of cohesion between the various layers of fabrics, and, furthermore, there is less give to the rubber and less ability to stand flexure without weakening.

TWO PARTS TO EACH TIRE

The tire comprises two definite parts, the rubber tread and the canvas case or carcass. It is the canvas base that does the actual work of the tire, the tread being used merely to protect the carcass from water, bruises and cuts. This means that it is vitally necessary to keep the tread always intact. Cuts must be plugged and vulcanized as soon as they are noticed. Of course, in time, even with the best of care, the rubber tread wears down and the canvas is exposed, and inevitably the complete wrecking of the tire follows. Retreading is effective only if the original base is entirely undamaged. If the canvas has been worn through, retreading will do no good. So a retread may save considerable money or it may simply be money wasted, because the carcass was not worth the retread applied to it. Therefore, in selecting the tire for retreading, one should be positively sure that the canvas base is absolutely undamaged. It is not always possible to detect damage to the carcass by cursory examination or by feeling of the casing. For that reason you find many owners who declare retreading a swindle, while others are strongly for it. It is merely a question of damaged or perfect carcasses.

A good many repair men make a practice of having retreading done over an old tread that has worn smooth. This is not at all a bad plan, but if the wear on the original tread has been uneven, one will get a bumpy, uneven surface which will not make for long wear. When this extra tread is applied over the original tread, naturally the tire loses something in resiliency, even if the pressure in it is reduced ten pounds, which is commonly done. However, many owners do this and find that it has given them a largely augmented mileage per tire. Another method of extracting extra mileage from a tire that has begun to wear considerably is to put in an inner-lining. This device is simply a strip of fabric, which is placed between the tube and the casing. Its function is to act as an extra strip of fabric in the casing.

Tires are one of the biggest items in the expense of running a motor car. In the case of the average motor car owner, the tire item is even bigger than it need be because he fails to heed two warnings that are constantly dinned into his ears by repair men, but which he neglects just the same.

One of these is in regard to keeping the tread intact. That is to say, having all holes and cuts plugged as quickly as they appear. The tread protects the base of the tire, the canvas fabric, from water, etc., and if cuts remain unfilled, water gets in and rots the canvas, after which the tire rapidly goes to pieces. The importance of the tire question is easily judged by the number of advertisements that appear in the papers and magazines of tire accessories of various sorts. Naturally, the makers of these inform the public that their use will enable said public to get the very last yard of mileage out of every tire. They may, but not unless the two basic rules quoted above are followed.

Long cuts in the tread of a tire are sometimes caused by the application of the brake. In such cases the car is traveling faster than the wheels, making them drag over some sharp obstacle. If the wheels are traveling faster than the car the results are liable to be the same.

Thin spots in the tread of a rear tire are usually due to the brake drum locking in the same place when the brake is applied, causing the tire to drag on the road at the same place at each severe application of the brake.

The repair gum in a tube repair may be tested with a pencil. When the repair is cold, press upon the repair gum with the point of a pencil, holding it firm for five seconds or longer. Remove it quickly and notice how rapidly the dent caused by the pencil point comes out. Then press upon the tube at a place which has not been repaired, and if the dent comes out about the same as the repair did, it is undoubtedly sufficiently cured. However, if it seems to be soft and the dent disappears slowly, it is under-cured and should be heated again.

It is not practical to test tire cures as above when the gum is too thick. The danger is that it would appear completely cured when it was really no more than half cured. Many experienced repair men advise that sectional repairs in tires be partly cured in the mold and then removed to an inside patch vulcanizer to finish the curing of the fabric inside the tire. However, in my opinion, it is almost impossible to know when the center between the outside of the tread and the inside ply of fabric is cured, because working both sides to the middle one cannot see anything from which to be guided. If the repairman is using a fabric that colors dark when cured and cures all in the mold, he will know that the center of the carcass is cured, else the inside certainly would not be. In this case it requires a fabric that will cure at a lower temperature in the same time required by the tread and cushion gum.

Few tire repair men fully realize the importance of careful and economical handling of repair materials. In the first place, it is seldom that the repair shop has any

efficient record of the amount of stock used in each repair job, and as a consequence the shop owner has no way of knowing just how much of his stock really goes into tires and how much of it goes to waste. On the other hand, proper handling and cutting of fabrics and gums not only will work a saving of material, but often it will effect a successful repair where otherwise the job might have failed prematurely. All fabrics should be cut on the bias. In the construction of the tire, the fabric is on the bias, and unless repair fabrics are applied in the same manner, the action of the fabric in the repair is foreign to the carcass fabric. As a result, the repair is not so flexible as the rest of the tire, and a pounding action develops with every revolution. The repair fabric is subjected to more strain than any other portion of the tire because it does not give and take up the stress of the road shocks in unison with the carcass fabric. Tire repair experts have tried repeatedly to impress upon the minds of shop owners the importance of following this rule, but it is surprising how many shops there are where the practice is not followed, either because of neglect or because the vulcanizer has not told his helpers how important it is in order to secure good results. Next in importance to cutting fabric on the bias, is cutting it in such a manner as to prevent waste as much as possible.

Many repair men who realize the great saving that can be effected where the custom is followed, cut all fabrics in strips measured to fit the daily needs of the shop. The repair shop man should familiarize himself with the fabric widths most in use, and in a short time he can gauge accurately the proper amount of fabric to be cut to each of the various widths used in making the repairs. With this method there is a saving that will mean a great deal to the average repair man in a month. Fabric sometimes is wasted when a strip of the needed size is cut from the roll, leaving a piece too small for the needs of the next man who finds use for the roll.

All repair gums should be cut with and not across the roll. Rubber, like wood, has a grain, and is much stronger when it is cut with the grain than across it.

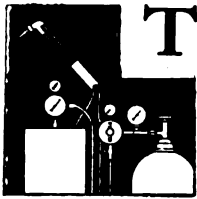
KEEP DIRT FROM REPAIR MATERIALS

Repair materials, both gums and fabrics, should be kept free from dirt. If soapstone or dust is allowed to remain on material used in making a repair, a porous repair often occurs or separations between plies or in the tread result when the tire is put into service. Dust-proof vases or coverings should be provided and all material should be kept in a cool, dry place whenever possible. Excessive washing of repair materials with gasoline should be avoided. Keep repair stock covered whenever possible. Repair materials easily assimilate moisture, and poor results are sure to follow if any moisture is allowed to remain in them when they are cured. Tire repair men who follow these few simple rules will be surprised at the amount of money saved during a month's time and at the improved results obtained in their work.

How to Weld a Motor Cylinder

BY

DAVID BAXTER



THE welding of a cracked automobile engine cylinder is quite a particular piece of work, even though the welding-torch operator is well versed in his art. For it is more than a matter of skillful flame manipulation, of fusing and flowing together of molten iron. In fact it requires but moderate skill in this line.

The raw student soon learns to fuse and fill a cracked water jacket weld. And he also learns that it will crack again and again if he does not heat it properly, previous to the welding, to take care of the expanding and contracting metal.

The welding of a cracked automobile cylinder or cylinder block is in reality a problem in expansion and contraction; in reality a problem in heating and cooling. Expansion and contraction are so essentially a part of the welding process that they are not to be ignored. It is the contraction that causes the weld to crack again after it is welded but it is certain to crack back if the cylinder is not preheated or is insufficiently heated before applying the welding flame. Expansion causes warping more frequently than it causes cracking, while contraction causes sudden strains and open cracks.

The weld metal may be fused with the iron of the cracked jacket almost perfectly and still the casting, or weld, will crack when the weld contracts if the job is not expanded before the weld metal is applied. And on the other hand, a poorly made weld may not crack at all if the preheating is properly attended. It is quite obvious then that the welding of a cracked cylinder such as is shown in the accompanying photographs is more a matter of controlling contraction than it is one of scientifically fusing the metals.

It is scarcely necessary to mention that all metals expand or increase their dimensions upon being heated; the slower the heat, the slower the expansion; the more heat, the greater the expansion, up to a certain limit; and the faster the heat the more rapid the expansion. Which infers that the cylinder will stretch in outside dimensions when heated; or, that any part will increase in size when heat is applied to it. This means that filler metal will also expand; it is fully expanded when molten. When both the casting and the filler metal, or either, cool, the tendency is to shrink to normal size as before the heating. Therefore the jacket metal must give, or follow the contraction of the weld metal inward when the latter cools and shrinks. If it is not free to give when the weld metal cools or if it will not follow the shrinkage of the weld metal inward, then the weld metal must pull away from it, usually in the weakest portion; to form one or more cracks. The surrounding metal is cold and the weld

metal is hot so it is easy to see what will happen when the weld metal cools and shrinks and the cold metal cannot stretch or follow the shrinkage inward.

To overcome this evil the welder must endeavor to expand the jacket metal so it will shrink in unison with the weld metal. In other words he is to endeavor to have the contraction of the surrounding casting follow the contraction of the weld inward; to shrink as the weld shrinks. In effect, to squeeze inward upon the weld metal when both are cold.



Grooving Crack on Emery Wheel.

Now in spite of this seemingly impressive array of difficulties the welding of a cracked water jacket is quite simple to the welder who has grasped the theory of controlling contraction. He has only to make such arrangements as will insure the casting being expanded when the weld is executed and that it will cool and contract when the weld cools. The simplest and probably the only way to do this in safety is to heat the whole cylinder casting before applying the welding flame; the cylinder is then enlarged enough that it will contract inward upon the heels of the weld contraction if both cool uniformly. But following the heating and welding, the casting must cool slowly.

The expansion must be even and regular throughout the whole casting else some part may not react in unison.

Probably the simplest way to make the matter clear is to take a specific example of cylinder welding and follow it through the different stages of the welding process. Many minor details have a bearing upon the final result, so that instruction in the main factors of the case may not

suffice in every instance. Therefore let us take the how and wherefore of the entire procedure of welding a single cylinder having a cracked water jacket, such as is illustrated herein.

The first step in the process, which is partially illustrated in Fig. 1, is the preparing of the cylinder for welding. A V-shaped groove is cut the full length of the crack by grinding out the metal on a small emery wheel. This groove is approximately twice as wide at the top as the thickness of the metal through which it extends. It is very nearly full depth of the metal thickness. As will be noted, the groove is nearly the full depth of this metal thickness, extending from the top of the casting over the shoulder and down the side; this is a fact which made it necessary to weld the job in two positions.



First Step In Making Fire Brick Preheater.

Another step in preparing the job for welding consisted of cleaning the surface in the vicinity of the crack. A space about an inch wide along both sides of the groove was cleaned thoroughly of all paint, dirt, and rust. This was handily accomplished by holding the casting firmly against the corner of the emery wheel until the metal was cleaned bright and bare.

This grooving and cleaning could have been done with a hammer and chisel; using a diamond point chisel to cut the groove and a flat tool to remove the grease and paint. But there is some danger of lengthening the crack where a hammer is used.

The reasons for this grooving and cleaning are that the torch operator could reach the full thickness of the metal without being forced to melt so much metal as is the case where the weld is made without grooving. He could build the weld from the bottom upward and not have to force the welding flame so deeply into the metal, a practice which often results in poorly connected, spongy welds. To make a weld without first grooving the crack,

frequently requires the flame to be bored directly into the molten bath before proper penetration can be achieved. This is found to inject oxygen or carbon into the melted mass to cause blow holes and other defects, it is much better practice to groove the weld; even where the metal is less than a quarter of an inch thick; even if it does require a little labor and time.

Other reasons for grooving and cleaning are that the welder can then see what he is accomplishing and knows that no foreign matter is going to get caught in the weld to form gas and come to the surface as it congeals to form blow holes and at least spoil the appearance of the weld. Of course many of the impurities are consumed by the welding flame but there is always a chance that they will not be.

After the grooving, the next step in the process was arranging to heat the casting previous to applying the welding flame.

No expensive apparatus is required for preheating jobs like this cylinder. Nor is any special form of furnace or oven necessary for this class of work. Although it is probably better to have some sort of fixed preheating oven if much of any one class of welding is handled.

The preheater for this particular cylinder was simple, indeed, but the material used in its construction could be used again many times. A common home made blacksmith forge, a number of fire bricks, some short iron bars and a quantity of asbestos paper were all that were necessary to do the preheating and slow cooling. Shops that are equipped with an oil heater or that have access to natural gas supply are better fixed for preheating, it is true, because these agencies furnish a heat that is under control almost to the last degree. But a forge makes a preheater which is within the reach of nearly everyone and which will give good service if handled rightly.

In preheating the cylinder under discussion, the forge fire was first walled around with a ring of fire brick placed on edge as shown in Fig. 2. One brick was omitted from the ring in front to form a fire door. The short iron bars were placed across the top of the brick to form a sort of grid or grating, on top of which was situated the cracked casting in its first or preheating position; this is shown in the picture.

The bore of the cylinder was first stuffed with scraps of asbestos paper to prevent the fire from coming in direct contact with the polished metal. Direct contact with fire sometimes causes a scale to form on the walls of the cylinder bore, which is harmful.

On the forge fire the space beneath the rod grating was filled with charcoal broken to pieces about the size of an egg. This was kindled by running the forge blower a few minutes. Then, while the charcoal was igniting the rest of the preheating oven was constructed. A crude wall of fire brick was built around the casting on top of the grating, over the top of which was placed some pieces of the asbestos paper.

Thus the heat of the forge and charcoal fire was confined around the cracked cylinder casting. The object being to heat it evenly throughout and to prevent cold draughts of air from striking the heated casting. The

brick wall also protected the torch operator from the heat. Whenever the fire needed replenishing, fresh charcoal was fed through the fire-door opening. And whenever the fire needed enlivening the forge blower was turned on a few minutes. Or when the fire needed to be checked a little a brick was placed in front of the door and cinders were piled around the lower ring of brick; this slowed the fire down and held the heat steady. In this way the heat was under fairly good control at all times.



Completed Preheater—Welder at Work.

The cylinder was permitted to heat until it became light red all over, when it was ready to weld. The heat condition was ascertained by peeping beneath the asbestos covering from time to time during the heating process. Then as soon as the casting was red the torch was lighted and its flame applied through an opening torn in the asbestos directly over the end of the heated groove. Fig. 3 shows the complete preheater and the welding in operation.

A long torch fitted with a medium sized tip was employed. A small tip for such jobs doesn't furnish a flame large enough for fast welding. While a large flame affords too much opportunity for oxidizing the metal and makes the weld too wide. And a large flame, because of its power, is more difficult to control and is therefore liable to overheat too great an area; there is much more danger of burning the metal too. Therefore a medium flame was selected for this job.

The torch was lighted and regulated to burn with a neutral flame, which is made up of equal parts of oxygen and acetylene; that is, neither flame element was in excess. The neutral flame is the safest for cast iron. There is less danger of oxidizing or carbonizing the metal with a neutral flame.

When this flame was achieved it was thrust through the opening made by tearing the asbestos paper with the filler rod. Both the flame and the rod were brought in contact with the red hot cylinder at the end of the groove.

The flame was revolved in small circles over the upper end of the groove. And as the groove commenced to turn bright red the revolving flame was concentrated in one spot which barely included both sides of the sloping groove. Then the filler, which had been heating with each revolution of the flame, was quickly dipped in a pot of flux powder to deposit a quantity upon the melting groove. The flame was then manipulated to bring a portion of the rod and a section of the groove to a melted state. The molten filler was pushed into the molten groove as the flame gradually worked to another portion of the groove where the process was repeated; only to move slowly to yet another section of the groove where the process was again repeated. Meanwhile the rod brought fresh supplies of flux powder.

Thus the groove was filled in a succession of connecting pools. The flame was continually swinging in arcs over the groove and over the rod which was given a twisting movement to settle it into the molten bath and fuse it with the cylinder metal.

As soon as the groove was welded to the shoulder of the cylinder the torch and filler were quickly placed aside. The asbestos cover was removed from the furnace. And with a pair of tongs the welder turned the casting upon one side to bring the unwelded part of the groove upward to what might be called the second welding position. Then without unnecessary delay the asbestos covering was replaced.

The torch was lighted again and the flame applied through another aperture in the paper, to the groove at the place where the preceding welding had stopped. Here it was revolved over the end of the last filled portion. As this commenced to melt, the filler was brought in contact with it. The flame and filler were then used to open the old weld. As it started to melt the filler was twisted into it. Then the flame was gradually worked to an unwelded portion of the groove; thus making the weld once more continuous.

This weld along the side of the cylinder was made in the same way as the one above the shoulder. Each section of welding was but a continuation of the others. At the last, or closed end, of the weld the melting was carried slightly beyond the groove to be sure the entire crack was welded.

When the last section of the weld was completed the brick furnace was again covered with the asbestos paper. Some of it was draped over the cylinder inside of the wall to prevent cold air from reaching the casting; and to cut radiation to a minimum. Everything possible was done to force the job to cool slowly.

Slow cooling was no doubt the most important factor in the success of the job, as it permitted the hottest parts of the casting to pass their heat by conduction to the cooler parts and thus equalize the contraction of the whole casting.

(Concluded on page 50)

What Jones Did to Clark's Business

The Ups and Downs of a Small Town Garage—Practical
Lessons for the Small Town Garage Owner—
With a Fighting Spirit

BY GEO. RICE

THIS is a story of a garage and automobile repair shop located in a middle western town, in which business was slack, the cash drawer in the office short of funds, the account at the bank overdrawn, credit with the supply houses so uncertain that cash had to be paid for supplies, and bankruptcy was in sight.

The location of this establishment was favorable, for it was on a thoroughfare over which many automobiles and motor trucks passed at all hours of the day and often far into the night. The proprietor was a middle-aged man who had been a salesman in a grocery store, and who had acquired his knowledge of automobile engineering and salesmanship in the technical schools. He could make accurate adjustments of the mechanical parts of an automobile or a truck as well as anyone. But he was incapable of managing the business in which he had invested his savings of many years, was discouraged, and was seriously considering the best method of getting rid of the burden which was crushing him.

He had repeatedly advertised the business for sale without receiving what he considered to be a reasonable offer. He had tried to get a partner to come in with sufficient funds to keep the place out of the hands of the receiver. He had borrowed money from the local bank, giving his stock and fixtures as collateral and was paying 8 percent annual interest on the same.

He had a repair mechanic and a janitor in his employ and the former had just requested an increase in pay while the other was considering the acceptance of a more lucrative position. And as if to make conditions more annoying for Mr. Clark, which is the name by which we will call him, a competing garage and repair shop in the next block was doing a thriving business with a smaller plant and seemingly an inferior equipment.

AN AUTOMOBILE ACCESSORIES SALESMAN ARRIVES

At this time, when the Clark garage was on the brink of a total collapse, an automobile accessories salesman by the name of Jones arrived and displayed samples of his line for the purpose of obtaining orders from the disheartened Mr. Clark. The latter promptly resented all attempts on the part of the salesman to place an order, refusing even to look at the samples. But Jones was not

of the type of salesman to be put off so easily. He began asking questions. In a very brief time he had the details concerning the near-insolvency of the establishment and a recommendation to make. It seems that Jones had been on the lookout for an opportunity to engage in the garage and repair business for some time. He made a proposition to Clark that he be taken into the employ of the establishment with a view of ultimately buying it providing that satisfactory arrangements could be made. Clark was only too glad to have someone take enough interest in the place to consider taking it off his hands. But Clark was fair.

"Look at this," he said, as he opened the drawer of the cash register. "Only a little change, a few postage stamps, a small check and an unpaid bill. Look at this account book. It shows that while many people owe me for rent charges on their cars, for repair service, and supplies of all kinds, I owe much more for the rent of this building and for stock purchased from the factories.

"My nerves are breaking under the strain. I will be honest with you, my friend. This business is going on the rocks. Do you want to give up your position as a successful salesman to burden yourself with a wreck?"

To all this Jones replied to the effect that while he had a remunerative position with a large distributing agency, he did not think it was right for him to continue as a salesman indefinitely when he felt that he was qualified to handle larger things. He explained that he had been watching for an opening for more than a year. That he had carefully investigated several openings for the starting of a new garage and shop in promising localities. That thus far he had not seen any opening to impress him as favorably as this one.

Clark cut in here with the remark that "This is not the place you are looking for young man. There is nothing promising here. This shop is dead. The town is dead." But Jones thought differently. His training as a salesman had taught him to use his own judgment and he determined to do this. He went away, stopped at the local hotel and made inquiries; and counted the average number of cars passing Clark's establishment each hour, made inquiries at the neighboring stores about the place, consulted Bradstreet's and interviewed some of the patrons in the salesroom and repair shop, so that in a few days he had learned considerable concerning the possibilities of

We are all of us interested in knowing how some other fellow, who has had to struggle with the same problems that are likely to confront our business, succeeded in solving them. The writer of this story tells a tale of experiences that carry their own lesson for many who will read of "What Jones Did To Clark's Business"—Is there a fellow like Jones in your town?

putting the partly wrecked place on its feet. Before a week had passed Clark and Jones had come to an agreement by which the latter should enter the employ of the former for the purpose of ultimately buying the place or becoming a partner. No papers were drawn up. It was a verbal understanding only. Clark did not care, as he felt that the wild scheme of the salesman would end in a week or less and that Jones would depart.

JONES BEGINS HOUSECLEANING

The day after the somewhat odd agreement was made between Clark and Jones, the latter proposed that he be given full charge of the business for thirty days. Clark did not know whether he ought to get mad or not at such a suggestion. Here was a young upstart just hired on probation who requested the boss to kindly step aside and give him full sway for a month. But when the head man of any institution is completely discouraged, and is on the alert for the arrival of the sheriff, and would feel relieved if a fire would wipe out the whole establishment, he does not have the heart to argue. Clark merely handed the keys to Jones and told him to proceed. He thought that he would go on a vacation for thirty days, but he was detained for fear that the hair-brained idea of the presumptuous Jones would end speedily and he wanted to be near to care for the place.

Jones was given full charge and in two days when Clark visited the old place he was not surprised to see a heap of broken parts of cars in the lot adjoining, for he had expected to see something even worse. In this pile of discarded parts there were broken automobile tops, wrecked bicycles, smashed baby carriages, old tires, split wheel rims, rusted parts of engines, twisted wire, empty barrels, old boxes and similar truck. On top of the heap was a sign reading "Take your pick for one dollar."

Inside the building Jones and the two men in overalls were cleaning the rubbish from every nook and corner. All old and out-of-date equipment was being removed to make room for new. The dust and the cobwebs were scraped from places where spiders had reigned a long time.

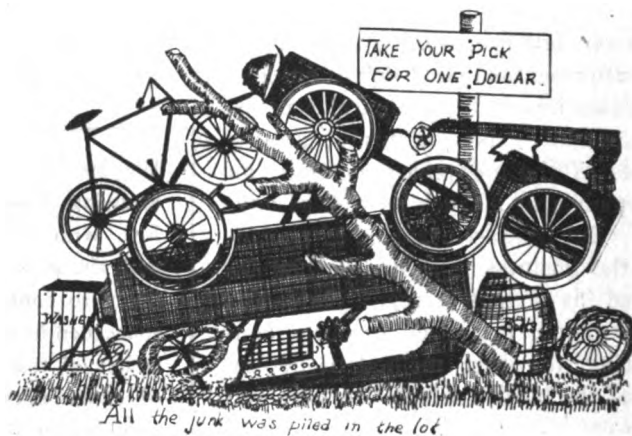
Clark began to curse. He was cut short by Jones who reminded him of the agreement. "Remember," said Jones, "I am to have my way for thirty days. If at the end of that time, this joint is not off the breakers, you may relieve yourself by cussing, and in addition you may kick me out without pay or a recommendation." Jones always had a nice way of smoothing over any misunderstanding, with the result that Clark smiled and replied, "You are right." Thus ended the first move in Jones' plan for the rejuvenating of the Clark garage and shop.

RENOVATING THE PLACE

Jones was a fast worker. In a few days the old garage and repair shop looked different. Arrangements were made to substitute most of the antique repairing equipment with new replacements. Jones had two problems to contend with. One was to retrieve the lost reputation of the establishment and the other to manage Clark, for the latter filed objections to nearly every move. He was re-

minded that he had agreed to keep away for a specified time, but excused himself by saying that he had always led an active life and was unable to remain in idleness. It was hoped that he would be taken ill, or would go away for a rest. He was too healthy for the former and too uneasy for the latter with the result that the shop force had to do the best they could regardless of his interference.

Fortunately for Jones and the two men who were busy overhauling the plant, considerable interest was shown in the miscellaneous pile of junk which had been thrown out as worthless. Persons who desired to purchase a piece which they thought they might use were waited on by Clark. The latter would get the morning paper and seat himself on the cushions of an abandoned car seat which had been cast out, and read and smoke for hours while an occasional customer poked over the articles and purchased one.



Meanwhile Jones worked hard inside. He had had sufficient experience in the automobile business to realize that if the plant was put into proper condition and rightly managed, it would pay.

He based his opinion on the favorable location of the plant, the capacity of the shop, the large garage and the department set off for carrying a moderate stock of supplies. The town was a growing one and with the increase of population there would be an increased business. There were many residences of the wealthy in the suburbs and Jones noticed that these people frequently passed in their high-priced cars. Jones would cater to their trade, for the financial return for repair service and supplies for such cars is more satisfactory than for cheap cars. There were also a number of large mercantile establishments less than a dozen blocks away and Jones felt that he could get some of the business in connection with the trucks used by these firms. In fact, Jones had looked over the ground very carefully before he had made up his mind that this particular garage and machine shop were what he had been looking for. He had located a shoe factory, a cotton mill, a flour mill and a number of woodworking establishments in the town and knew that if these concerns operated motor trucks he could obtain a fair share of their custom; and if they did not have motor trucks he might be able to sell them one or more.

WHY CLARK FELL DOWN

But before Jones had practically forced himself into the position in which we now find him, he had taken the precaution to ascertain some of the reasons why Clark had failed. He obtained an abundance of the desired information as to the status of the place, some of which was undoubtedly exaggerated, by talking with the storekeepers and clerks of the locality. The day clerk in the neighboring hotel had Clark sized up and did not hesitate to express himself rather harshly for the reason that in the opinion of the clerk the hotel had been overcharged on some automobile repair work.

"That fellow charged us \$8 for a \$3 job," said the clerk, "and when we objected to paying the bill, he said that he was obliged to pay the repairman time and a half for working overtime. We never ordered the work to be done on overtime. That was his lookout and he should have stood the loss and not charged it to us. We send our machines to another place for repairs now."

In another hotel visited by Jones, it was learned that a distinguished guest of the hotel sent his fine car to the Clark garage for repairs. It was not returned at the stated time and when sent for was found to be out in a joy riding party of which one of the repairmen of the shop was a member. The excuse was made that the repairman took the car to try it before delivering it. But the gay joy riders had been seen racing in the car and this event injured the business of the garage.

Jones also found that Clark was not prompt in paying his bills. He seldom had the advantage of the discounts for cash as he did not have the ready money to make the payments. Often the bills overlapped from month to month and frequently interest was added after 90 days, all of which made an unnecessary loss.

Jones concluded that Clark got into his present position through lack of proper management. The business had been run perpetually backward instead of forward. The plant would be a money maker if properly handled and Jones felt that he could handle it. His training had been in sales organizations of automobile accessories, but it has been proven often that men thus trained have managed garages and repair shops with better financial returns than men who have been trained in the garage or the shop.

It is possible to procure the services at a nominal salary of a man who is capable of supervising the work in a garage, and who will attend to the checking in and out of the cars, to the cleaning of the cars when required, and to their general care. It is also possible to procure the services of experienced and capable automobile machinists who can adjust and repair any part of the engine or other mechanism of the highest as well as the cheapest types of automobiles and trucks. Competent salesmen are available for the sales department and trained book keepers for the clerical work in the office. But when it comes to securing the services of a general manager of all of the departments of a modern garage, repair shop and sales department, the matter is more difficult and complicated. Many good managers graduate from the repair shop. Others from the sales room or the paint shop. Jones came

with as high a degree of training as a salesman as the average man of this profession, but in addition he possessed push, energy, ingenuity, observation and a good constitution. On top of all these valuable assets for an automobile garage and repair shop manager, he was lucky enough to have what might be called a pleasing personality. He knew how to please people. Men of the Clark type fuss and growl over a hard repair job on a car which has been smashed in an accident and which they think will not bring much profit. They like the easy jobs that bring high profits with little labor. Men of the Clark type usually go around with a grouch and the grouch often becomes epidemic in the shop; and when a customer enters, he finds a grouchy lot of men and he too imbibes some of the same feeling and when in such condition is likely to alter his mind about buying the very article he seeks, or getting a new tire on a wheel, or having his car painted or other contemplated service.

Jones was brainy enough to realize that the time when almost anyone could hire a vacant stable or similar building, and sweep it out and go over the walls with some whitewash and put out the sign of a garage or machine shop and get a rush of business from the best class of automobilists, had long since passed.

He knew that people who store high priced cars want to be sure that the storage room is clean, airy, and accessible. That owners of good cars are not going to run their machines into a shop where they can see that the machine equipment is out of date, or lacking in many details, and take a chance on having the fine mechanisms of their engines damaged by crude methods.

So Jones started in to renovate. And the renovation had to be accomplished without ready funds. It was easy to throw out rubbish, and make a pile outside in the adjoining lot of worn out mechanisms, but when it came to paying out several thousand dollars for replacements, another problem presented itself. Neither partner had capital or credit. The plant was in disrepute. The books registered a loss every day of the week except Saturday and Sunday, when tourists passing through patronized the place. It looked like a hopeless proposition.



FIG. 1

GETTING THE FARMERS' TRADE

When Jones undertook to keep the Clark garage and repair shop out of the hands of the receiver there was not enough business conducted in either the garage or the shop to pay running expenses. Neither the town, the tourist or the farmers' business had been specially sought. There had been practically no advertising in the local

press or by means of circulars or cards. No effort had been made to obtain business of any kind. Jones realized that something had to be done at once in order to have some sort of an income to depend upon. He knew that in all parts of the country the farmers' trade is a more important item in the success of any enterprise than is usually supposed. The bulk of the population living outside the cities and towns either possesses automobiles or trucks or is considering buying them. The farmers with their families or with the products of their farms can be seen during all hours of the day and evening in any town. Jones was not slow in taking advantage of this suburban business. First, he noticed that while there were several garages and repair shops in the town,

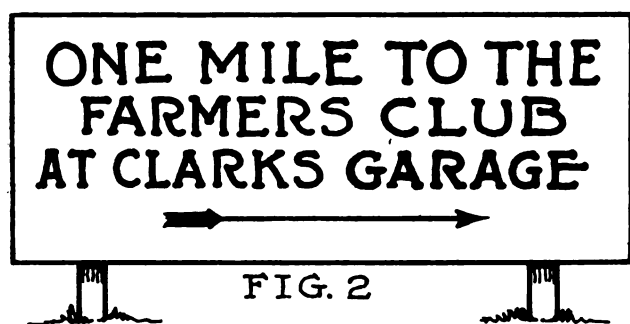


FIG. 2

that none of them had any accommodation for farmers or farmers' families in the shape of a rest room. The railway depot, the public library and sometimes the waiting rooms of the hotels were used by the visitors from the country while their cars were left outside. Jones had a space partitioned off in one corner of the garage; a wash stand and toilet were installed and some tables and chairs arranged with other conveniences, such as reading and writing material.

A canvas was hung at one side back of which the women folks could arrange their hair and wash. Then the painter next door was given an order for fifty board signs, 2 by 3 feet in size, on which were painted in bold face, black letters, on a white ground, "Farmers' Rest at Clark's Garage" and "One mile to the Farmers' Club at Clark's Garage." The first mentioned signs were nailed to the posts, trees and other handy supports along the roadside leading to towns at distances ranging from one to three miles.

The one mile signs were put up within a radius of one mile. Each sign had an arrow on it pointing the way.

PERSONAL ACQUAINTANCE WITH FARMERS AN ASSET

Jones interviewed the farmers wherever he met them. He did not try to sell them auto or truck accessories, but he told them where they could buy anything they wanted for their automobiles or trucks when in town. He left a card with each farmer on which the business of the Clark garage was outlined, and at the bottom was printed an invitation to make use of the rest room. Jones found that the farmers appreciated the rest room idea. They expressed their satisfaction when informed that they could always find a welcome there. They were pleased

when told that the accommodation would be provided free of all cost. They could, if they wished, take their lunches with them and lunch in the rest room. Such hospitality appealed to the farmers and their families and in a remarkably short time the results of the road advertising and the personal talks with the leading farmers, began to materialize in the form of increased business from the country.

Jones had also put up a number of plainly printed signs at the outskirts of the town reading, "Ten blocks to Clark's garage and Repair Shop." The arrow on the signs pointed the direction to take and these signs were the means of attracting not only the farmers but tourists to the shop for repair service or to purchase supplies.

TYPEWRITTEN LETTERS SENT OUT

The farmers are constantly receiving the advertising literature of the mail order houses and other printed circulars which are not always read. But when the farmers receive a typewritten letter in a sealed envelope and a two-cent stamp on it, they usually read the contents. Jones knew this characteristic of the farmer and consequently obtained the names and addresses of many farmers located within a radius of five miles and sent each a typewritten letter, signed in ink, properly sealed, inviting their patronage of the rest room, the garage and the repair shop. A list of the accessories on sale was omitted for the reason that the stock was badly depleted and there was no ready cash to replace needed articles and the credit of the establishment with the supply

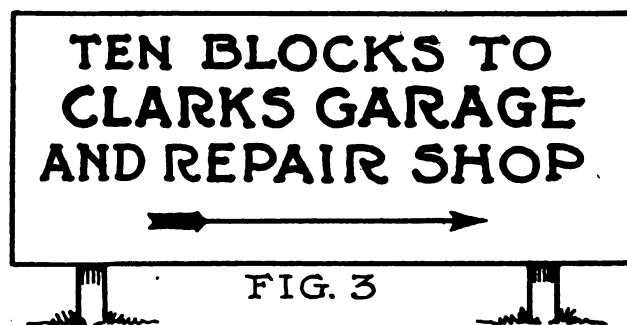


FIG. 3

houses was nil. The farmer used to be a profitable mark for the lightning rod agent, the book agent and oftentimes various kinds of fake agents of farming machinery, for which a cash instalment would be collected and the machine never sent. With the disappearance of the lightning rod men and the fake agents of farming implements, legitimate business is given an opportunity and Jones benefited from this fact.

The events that followed proved that the farmers noticed the road signs and read the typewritten letters, for they began to patronize the place.

MOSTLY A CASH BUSINESS

One of the reasons for the failure of the business to pay before was due to the numerous charge accounts, some of which could not be collected. Often the local automobilists and business men had repairs done only to

request that the work be charged and the bill forwarded at the end of the month. Sometimes these bills were paid. Often they were not. The farmers seldom asked for credit. They expected to pay cash and almost always did. The cash payments from the farmers was all that saved the business from total collapse. The ready cash made it possible to pay some of the most pressing accounts and at the same time pay for immediate supplies required in the repair shop and sales department, as well as to pay the wages of the help each Saturday night. This was pleasing to the repairman and the others, for they had not received their weekly wages very regularly for months.

Another profitable result of the farmers' trade was due to the presence of the junk pile in the lot next door. This pile of discarded parts of cars was intended for the old metal market. It was interesting to watch some of the farmers overhaul the pile and pick out certain pieces of mechanism which they considered as useful on the farm. One farmer hauled out the motor and propelling attachments of an old truck, had a few repairs made to it, and put it into service on his farm to operate a number of butter making machines. Another would find a wheel in better running order than a wheel on his own car and would buy it. Bolts, screws, and all manner of small parts were carefully picked out and purchased, so that in a few weeks the pile of cast-off parts of automobiles and trucks which would have brought but a small sum of money if sold in the junk market, was sold for a considerable cash return.

Jones found a lot of oils in the basement which someone had purchased for the automobile trade, but which oils were intended for the lubrication of the bearings of heavy machinery. This oil represented an investment of several hundreds of dollars, and as it would never do to palm it off for use in motors or on any part of an automobile or truck, Jones attracted notice to the establishment by advertising these cans of machine oil for sale at less than half the cost of the wholesale figure. The farmers bought much of this heavy oil for their farming machinery, while the local trade took some for use in machine shops, factories and plants using heavy machinery. This sale meant a loss on the original investment, but it brought in a few hundred dollars in cash, when ready money was needed, and at the same time advertised the sales department. Of course if this kind of oil were to be carried regularly in stock, it would never do to cut the price, for it would not be easy to get back to the standard price. But the idea of Jones was to get rid of the oil, and to obtain needed cash. Regardless of the increased flow of ready money from the farmers' trade and the sale of junk and oil, the business was yet far from a paying condition, and continued efforts had to be made by Jones to make good. His next act was to start a run on brakes and the repairing of brakes for the reason that the police had recently reported an abnormal number of accidents due to defective brakes. This move on the part of the enterprising Jones will be described next.

(To Be Continued)

Show Calendar

PHILADELPHIA, Pa.—Passenger Car Show, auspices of the Philadelphia Automobile Trade Assn., Commercial Museum, Louis C. Block, manager; January.

CLEVELAND, Ohio.—Annual Winter Show, auspices of the Cleveland Automobile Manufacturers' and Dealers' Assn.; Jan. 20-27.

CHICAGO, Ill.—National Automobile Show, auspices of the National Automobile Chamber of Commerce, Coliseum; Jan. 27-Feb. 3.

CHICAGO, Ill.—Annual Automobile Salon, auspices of the National Automobile Chamber of Commerce, Drake Hotel; Jan. 27-Feb. 3.

HARTFORD, Conn.—Automobile Show, auspices of the Hartford Automobile Dealers' Assn., State Armory, Arthur Fifott, manager; February.

MINNEAPOLIS, Minn.—Annual Automobile Show, auspices of the Minneapolis Automobile Trade Assn., W. R. Wilmot, manager; Feb. 3-10.

NEW YORK, N. Y.—Annual Automobile Show, auspices of the Brooklyn Motor Vehicle Dealers' Assn., 23 Regiment Armory; Feb. 24-Mar. 3.

SYRACUSE, N. Y.—Annual Automobile Show, auspices of the Syracuse Automobile Dealers' Assn.; Feb. 26-Mar. 3.

NEWARK, N. J.—Annual Automobile Show, auspices of the Newark Auto Trade Assn., Claude E. Holgate, manager; Mar. 10-17.

BOSTON, Mass.—Passenger Car, Truck and Accessory Show, auspices of the Boston Automobile Dealers' Assn., Mechanics Building, Chester I. Campbell, manager; Mar. 10-17.

ATLANTA, Ga.—3rd Annual Great Southern Automobile Show, City Auditorium. Passenger cars and accessories. V. W. Shepard, Mgr., 22 Edgewood Ave.; February 17-24.

PORTLAND, Ore.—14th Annual Show of Automobile Dealers' Association of Portland. Municipal Auditorium. Passenger cars, trucks, tractors and accessories. Ralph J. Stachli, 424 Henry Building; Feb. 12-19.

WINNIPEG, Man.—Third Annual Automotive Equipment Show. Radio exhibits in connection. Under the auspices of the Western Canada Automotive Equipment Association. W. L. Williams, Secretary, Box 3164, Winnipeg; Feb. 5-10.

MONTREAL, Canada.—1923 Montreal Motor Show, under auspices of Montreal Automobile Trade Association, Almy's Building, Montreal, Jan. 20 to 27. Adelstan Levesque, Mgr., 115 Stanley St., Montreal.

How to Weld a Motor Cylinder

(Continued from page 44)

And thus we see that the main problem in this job was to cause the cylinder casting to heat slowly and evenly before the weld was executed and to again cause it to cool evenly and slowly, thereby contracting gradually as fast



The Welded Casting.

as the radiated heat could reach the outer air. There was no pull of contracting weld metal upon the rigid surrounding job metal, because the casting was contracting in unison with the contracting weld.

Standardizing Fan Belts

By G. A. Hancock

Engineering Department, L. H. Gilmer Company

IF automobile manufacturers would plan fan belt drives as carefully as the other work instead of leaving the placing of the fan belt as a last consideration, it would be a great step forward. Fan belt installation is now an afterthought in most cases. Manufacturers put everything else an automobile needs under the hood, and then hope there will be room left for a fan belt.

As a result all rules for the transmitting of power are violated when the time comes that a fan and driving belt must be put in.

On account of limited space under the hood, all pulleys are too small and most pulley centers too short, and the adjusting of centers a mere incident. The fan maker allows ample range, but the plan of assembly rarely permits the use of half of it.

The angle of the V pulley is almost generally adopted

at 28 degrees, but with the flat belt pulleys there is a diversified custom among makers that is surprising. One car has crown and flanged faces on both driver and driven. Other cars made by same people have both pulley faces straight. Others leave off the crown or flange on one or the other.

A slipping belt will run off of a crowned pulley more quickly than a straight, so our best results come from the crown on a driver and straight flange on the driven, it being the smaller pulley which slips more than the larger.

We have a research man at work constantly collecting data on belt installation for various cars. He has prepared a standardized chart giving essential measurements: pulley diameters, faces, centers, and adjustments. A proper fan belt installation cannot be determined without knowing the adjustment of pulley centers, the diameter of the fan, number of blades, the make of the fan, and the units driven by the drive pulley, which determines whether it is heavy or light duty. In some cases the same belt drives the pump or generator, giving a three point drive and allowing very little power for the driving of the fan. In all cases the belt should be installed as carefully as possible, to save bearing trouble.

A belt must have stretch to have life. Therefore, if the life has not been taken out of it in the making it will stretch or relax and there should be as much adjustment of the fan pulley as possible in order to take up this stretch from time to time. Engine and fan makers design ample provision for adjustment, but their most difficult problem is to convince automobile manufacturers that their specifications should be followed. Adjustment space of at least an inch between pulley centers where a flat belt is used, and at least two inches, where a round or V belt is used, should be allowed. One engine maker who builds for 45 automobile manufacturers recommends a pulley adjustment allowance of four inches.

From the standpoint of replacements, our aim has been so to classify our belt sizes that an accessory dealer could carry a minimum assortment of sizes and still give maximum service. We have accomplished this by acquainting ourselves with the actual measurements and conditions rather than with blue-print specifications which rarely give adjustment, and by taking advantage of adjustment latitudes, making possible the covering of a considerable range of dimensions with one belt. We keep an engineer on this research work, and he personally visits nearly every automobile factory yearly, to get the factory specifications.

We are reducing overhead for ourselves and for dealers by carrying on these investigations which enable us to cut down our belt groups to a minimum. Sometimes under the old system of accommodating ourselves to all sorts of fractional measurements we had to spend \$5 worth of time getting the measurement to supply a \$1 belt to a service station. This has been eliminated. When in full effect we estimate that the new grouping system will cut our overhead in supplying service stations by 10 per cent. and reduce the capital tied up in belts by service stations one-third.

New and Useful Automobile Accessories

POWER KING PORTABLE ELECTRIC DRILL

Electric Portable drills are being widely recognized as a necessity in every branch of the automotive industries, and indeed throughout the entire industrial world, wherever electricity is available. It is an essential tool in every modern garage or repair shop. One of the most favorably known lines of

dence in electric portable drills to justify their specifying this class of tool for continuous production purposes in their shop practice, or work layout. The aim of the manufacturers of POWER KING has been to produce a machine tool capable of the same enduring, arduous, service as that required of a drill-press, lathe, milling-machine, or any other standard piece of machine shop equipment, and it may be fairly

not only did not increase the side thrust on the motor pinion, but got away from it entirely, as the drive in Power King drill is centered between the two gears. This prevents all side thrusts and is one of the factors responsible for the unusually long life of the drill. Likewise, this same arrangement makes it possible to put the drill-head on the motor unit in any one of four positions, with the chuck occupying either top or bottom, or right or left hand position. This seems to be of value in permitting the operator to locate the chuck as he pleases, thus making it possible to get into corners and close places.

Each Power King is equipped with eight ball-bearings, enabling it to transmit its power into actual drilling, or reaming, with much less loss through friction than is the case with drills partly equipped with bronze bushings. The enormous loss in power occasioned by the long, bronze bushing with which the chuck spindle of an electric portable drill is ordinarily equipped, is in this manner entirely removed. While the drill is running idle, such a bronze bushing does not result in much loss of power, but while in actual operation, if the drill operator does not keep the drill bit in perfect alignment with the hole being drilled, the tendency will be to exert a side thrust on the chuck spindle which, due to the enormous leverage, will result in an imperceptible buckling of the spindle in the bronze bushing, with the result that tremendous friction will develop, robbing the drill of a fair portion of its actual power. This being a hand operated tool, and is being generally known that every



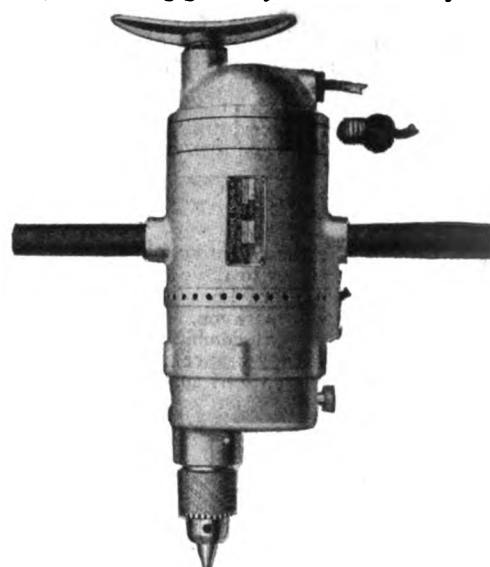
tools of this class is manufactured under the trade name of POWER KING by Jones, MacNeal & Camp, Inc., with factory and general offices at Warsaw, Indiana.

The history of this company and its product is evidence of the fact, so often commented upon, that the organization which produces something to serve mankind better, is sure to be recognized. Its consistent, steady growth during the past seven years and the evident increasing popularity and demand for its product indicate that POWER KING drills are satisfying, in an indisputable manner, the needs of industry, and are recognized in many quarters as a distinct advance in electric portable drill design and construction.

From the beginning, it seems to have been the fixed intention of Jones, MacNeal & Camp, Inc., fairly to meet a situation that had up until then confined the sale of portable electric drills almost entirely to the intermittent user, and to produce a tool that would satisfactorily meet the demand for a machine capable of continuous operation under load, with a minimum of expense for upkeep. It has long been a recognized fact that many of the best informed engineers of the country, after prolonged experimentation with the best electric portable drills available, have designated these tools for intermittent performance, only, feeling that no electric portable drill had as yet been designed which could properly be called a continuous production machine. POWER KING was expressly designed for, and is now filling satisfactorily, the needs of exactly this class of users. In addition, it supplies a much more sturdy, powerful, and enduring machine for the usual intermittent work to which electric portable drills have usually been subjected. Prior to the appearance of the POWER KING drill, the result of investigation, research, and test, on the part of manufacturers and production engineers, had not built up sufficient confi-

stated that they have accomplished their purpose and are rapidly securing recognition of this fact throughout the mechanical world.

Each POWER KING drill is equipped with two speeds, effected by a simple gear shift, operated by hand instantaneously, and while the drill is in operation, or idle, at the option of the operator. The two speeds are obtained through varying gear ratios, and not through any change in the speed of the motor. The gear shift itself, has a refinement of design and construction that makes it as practical and useful as the multiple speed feature on modern lathes and drill-presses. Two speeds are essential for general purpose work. They enable one drill to cover a wide range of work in iron, wood, steel, or other materials, and to employ either high speed or carbon bits under correct working conditions. The desirability of the two-speed arrangement on portable electric drills has always been recognized by portable drill manufacturers, and mechanical engineers. Many different attempts have been made to produce a practical solution of this problem. One group of experiments dealt with gears. While they were able to produce the two speed arrangement by means of a change in gear ratio, the problem of side thrust on the driving pinion of the motor which already assumed large proportions, became greatly increased. The other method used to some extent, but which also proved unsatisfactory, was to obtain the change of speed by some form of resistance to the motor, thus slowing down the motor for the slow speed of the drill, with of course, a corresponding loss of power. As this was the exact opposite of the desired result, this too, failed. As is usual in such cases the solution when it was found was very simple, and rested upon the principle that the center of a circle is always equidistant from all points on its circumference. On this principle Mr. Camp designed the gear shifting mechanism of POWER KING drills, and



man has more strength on either his right or left side it becomes apparent that the situation mentioned above is always present in some degree. This is further evidenced by the breakage of bits. Jones, MacNeal & Camp, Inc., have placed combined radial and thrust ball-bearings at either end of the chuck spindle of Power King drills with the result that such a situation as described above could in no way develop noticeable friction. Bearings five times the size needed for maximum load are used throughout to insure an adequate factor of safety under all conditions.

Helical gears made in their own plant are used in Power King drills in place of the spur gears ordinarily found. These gears result in a more efficient transmission of power and eliminate a fair share of the noise incident to spur gears. All Power King gears are made of a special grade of chrome nickel steel, resulting in vastly more strength and durability than could be obtained with ordinary steel. These are housed in a separate unite filled with lubricant, and operated at all times in an oil bath, much similar to that used in automobiles. Buttress threaded brass oil conveyors are used instead of ordinary felt washers to prevent oil from entering the motor casing and escaping around the chuck spindle. These conveyors serve the double purpose of preventing egress of oil, and at the same time violently agitating it to secure proper lubrication of all parts at all times.

The motor used in all Power King drills is manufactured by the General Electric Company, and is exceptionally powerful, and most unusual in its ability to withstand abuse. Motors of the universal type for use with either AC or DC current are built into all models. It is the manufacturer's claim that it is an impossibility for one workman to stall a Power King drill on work within its rated capacity. We are informed that this statement has never been successfully challenged, and that its truth has been proven many times in actual trial.

Ventilation in Power King has been the subject of considerable research work and has been perfected to such a degree that the user is assured of a motor cooled in any reasonable atmosphere to an exceptionally low temperature. All Power King parts are interchangeable, and due to the unit method of assembly employed, are unusually accessible. The manufacturers guarantee their drills against any defect in workmanship or material for a period of one year from date of sale.

During our tour of inspection of this plant, we were deeply impressed with a test being made of a Power King drill on a non-stop run under load. It had been running 106 hours. It showed no appreciable rise in temperature and it certainly seemed to justify the belief that it would run continuously for an indefinite period.

We predict a very gratifying future for Power King drills and their manufacturers.

THE GRAYNIE SPARE TIRE LOCK

Among the new automobile accessories making their bows to the public this fall the Graynie Spare Tire Lock manufactured by the Graynie Corporation, stands out as a quality product. It combines practical utility with good appearance and is made in sizes to suit all types of spare tire carriers.



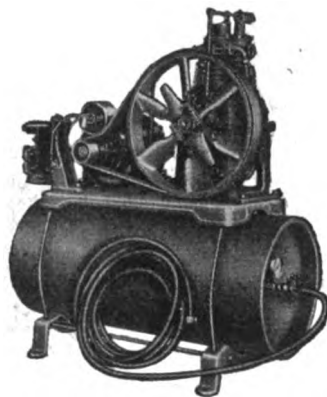
It is a link chain of specially heat treated steel encased in cow-hide as a protection against weather and wear and is locked with a patent lock and link bar. It will resist hack saw or file and is approved by the Underwriters' Laboratories as 100% secure.

The Graynie lock cannot rust or stick together; and due to the cow-hide casing, wear through chafing is reduced to the minimum. Over the key hole of the specially designed and patented lock is a dust cap which snaps securely in place and keeps the inside of the lock clean.

The necessity for securing the spare tire or tires from the thief is universally recognized and the average motorist will welcome a means of protection which not only is 100% efficient but which in appearance is a creditable addition to any car.

CURTIS HAS UNIQUE AIR COMPRESSOR DEMONSTRATION

The 1923 line of Curtis single and two-stage compressors has many noted improvements in design and as a result, has created considerable interest at the Automobile and



Accessory Shows where it has been on exhibition. A special built compressor having a glass crankcase, electrically lighted on the inside, is being displayed, showing in actual operation the exclusive CURTIS controlled splash oiling system.

A new type of belt tightener, which is self-adjusting, self-oiling and accommodates itself to variable loose and tight conditions of the belt automatically without the use of springs, permits shorter belt centers and consequently a more compact mounting of the compressor and motor. A smaller and lighter weight base is used, mounted symmetrically on the tank, which is the same capacity as was previously used but being larger in diameter and shorter, requires less floor space.

Seamless copper tubing is used between the compressor and tank instead of the usual wrought iron discharge pipe, eliminating several pipe fittings and thereby giving less chance for leaks and since the connection is made to the tank between the compressor and motor, it is in a more protected position. Long sweep bends insure less friction than in the unavoidable sharp angles of an iron pipe assembly.

All compressors both single and two-stage have a completely enclosed crankcase keeping out dust and foreign matter, and a vacuum breather valve which assures no oil on external surfaces of the machine.

A new and improved type of high and low level oil filling gauge, which also acts as an overflow and prevents too much oil being put into the compressor, is another feature of the new outfits.

The mounting of the gauge and outlet cock is now in the concave end of the tank, thereby being protected and not easily subject to injury.

All of these and many other features are explained in the new C22 catalog issued by the CURTIS Pneumatic Machinery Company, of St. Louis

AMERICAN STRIKER PLATES

Among the new accessories for the discriminating owner are American Striker Plates for closed car doors, guaranteed to stop annoying door rattles and the necessity of slamming the doors to close them. The American Governor Co. have recently brought out a new Striker Plate which not only takes up the natural wear of the door, thus avoiding rattles, but also prevents accidental opening of the door and possible loss of property and personal injury. It is unnecessary to slam the door to make it lock; a gentle push and the patent catch pulls the door closed and holds it securely. American Striker Plates are attractive in design, being made of highly polished bronze with hardened steel working parts. These plates are interchangeable with regular models and can be installed by anyone in ten minutes and work with any type of lock. John C. Hoof & Co. of Chicago are distributors and will exhibit American Striker Plates at the New York and Chicago Shows.

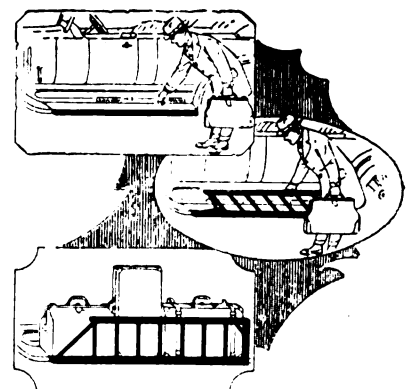
CLYDE H. PINNEY MAKES CHANGE

Clyde H. Pinney, formerly with the New York Branch of the Vesta Storage Battery Co., has become associated with the H. B. Shontz Co., Inc., 161 West 64th St., New York City, and will have charge of the sales of the Lincoln Shock Absorbers, the distribution of which has just been taken over by the H. B. Shontz Co., for the Metropolitan District.

GRIP RACK LUGGAGE CARRIER

A new type of luggage carrier that should move very quickly is called the Grip Rack. It folds compactly, occupying a space about an inch wide along the outer edge of the running board, yet it can be snapped open instantly. For satisfying a finicky motorist who demands that his car look its best at all times, this new carrier should prove a winner. The Grip Rack is made of heavy gauge steel throughout—firmly riveted and welded and cannot rattle. Attaching is easy—simply bolt it through the running board and it's on for keeps—it's so trim and neat the owner will never want to remove it, as it is useful all the year 'round.

The Grip Rack is dust-tight and cannot collect mud. Finished in hard-baked black enamel and packed in individual cartons, it



reaches the motorist clean and unblemished.

Made in three sizes, from which any car can be fitted, priced at \$5, \$6 and \$7.

Milwaukee Motor Products, Inc.—makers of the Milwaukee Timer for Fords—are the makers.

THE KISTER LIGHTNING VALVE LIFTER

Stop to picture in your mind the countless times the ugly task of lifting a stubborn valve spring has set you or your men sweating and grasping vainly about for "something" that would get the "blank" thing up and hold it there without slipping back just when you thought you were go-



flanges were machined a poor gasket was not so noticeable.

Today there is no necessity for anything like this happening for there is a flexible sheet packing which the manufacturer calls VELLUMOID, made especially for this work.

Its characteristics are—tough so that it stands rough handling; no breaking nor other injury either before or during assembling, thus insuring a perfect gasket. Very compressible so that it takes care of unevenness in the flanges. Durable—oil, gasoline and water simply toughen it so gaskets stay tight. No shellac has to be used and it is merely a waste of time to apply it to this material.

Tough as it is, it cuts easily with a knife so gaskets are readily fashioned or if preferred they can be tapped out.

Vellumoid is sold through jobbers and if you are not already familiar with it, the manufacturer will be glad to send you a working sample. You need this material and once using it, will always be its friend.

It is stocked in thicknesses .015 in. (1/64) .032 in. (1/32) and 1/16 in. the width being 36 in.

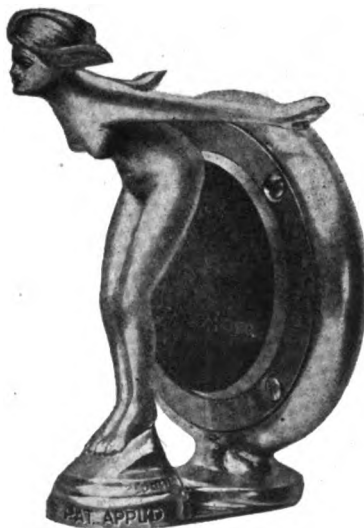
Manufactured by Fibre Finishing Company, 73 Tremont St., Boston, Mass., to whom all inquiries for details should be addressed.

MOTOR-METER "NYMPH"

Moto-Meter "Nymph" made of white metal and nickel plated to a fine and lasting finish is so constructed that it can be easily attached to the standard motometer of any automobile without in any way interfering with the reading of the meter.

Dealers throughout the country who have stocked this piece of equipment report that it finds immediate favor with the motorist, and there have been many repeat orders from dealers who easily have sold their first invoices in record time.

This particular piece of equipment not only offers a good profit to dealers, but because of its attractive lines and fine fin-



ish is easy to sell—a combination that should recommend it to the live equipment store operator on the lookout for unique numbers with which to swell his sales total.

Manufactured by Irving Florman Company, 80 Nassau Street, New York, N. Y.

"CANTON" PORTABLE CRANE AND HOIST

When there's a heavy job to lift, why take five men from their work to assist? Why not let one man get the "Handy Tool," hook it to the job, because he'll do it quickly and at such a big saving to you?

Let the others stay at their work, keep all machines busy and you will find that your saving of time and labor alone—to say nothing of your added production—



will in one year amount to many times the cost of this Crane.

"THE HANDIEST TOOL IN THE SHOP"

Canton Portable Crane goes quickly where nothing else can reach—into corners—under balconies—around machines, and to all those hard-to-get-at-places. It's a one-man machine that will handle more work in less time than six strong men could without it—one that is always ready to speed your work from one machine to the next or from one department to the other.

The Canton Foundry and Machine Co., of Canton, Ohio, recommend their No. 3 crane with low base 6¾" high for Garage work. The "Canton" is built in the strongest manner and is practically everlasting—you can't wear it out.

The "Handy Tool" is indispensable regardless of your present equipment—in fact, the most modernly equipped plants find that the time and labor saved with this Hoist is so far out of proportion to its cost that they actually lose money every day they operate without it.

**EVK-KLEAN SEAT PADS
PATENTED**

There has been some litigation and also a contest in the patent office as to the prior rights to the invention and patents of Evr-Klean Seat Pads. During the litigation of unfair competition the Welder-Shurford company have kept the automotive trade fully informed as to their rights to the original product and it will be of direct interest for our subscribers to know that United States letter patent No. 1436459 issued November 21st, 1922 which covers the basic idea of Evr-Klean Seat Pads in a very broad and constructive manner.

The patent was obtained after contest in the patent office which resulted in the patentee of the patent under which their product is manufactured being declared the first and original inventor of the construction of the Seat Pad.

VELLUMOID SHEET PACKING

In the earlier days of repair work, one of the familiar sights was the shellac pot or bottle with the hard, gummed up brush. When a gasket had to be made any old material which happened to be handy such as wrapping or blotting paper, was pressed into service.

In other words the repair man had no material made for gasket work and used any convenient substitute that he could lay hands on.

Time and labor were wasted in making and shellacking these flimsy gaskets which so often broke or were injured during the replacement, but in those days when

STERLING PRODUCTS

That the old-fashioned starting crank, familiarly known as the Armstrong Starter, is far from being a back number, is proved by the experience of the Sterling Products Corporation, of St. Louis, Mo. In the past six months this company has opened over one thousand retail accounts on their line

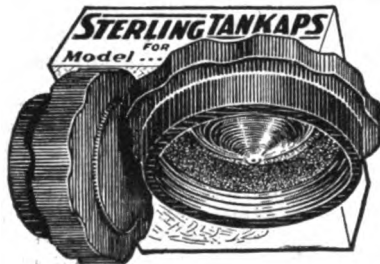


of Sterling Starting Cranks, of which some fifty-six types offer a crank to fit any car made.

Sterling cranks offer no new or startling features except their ready market. Their chief selling point seems to be the advantage of a small and inexpensive stock, from which any car owner can be served without the delay incident to the ordering of a crank from the car distributor or factory.

A new Sterling Product will be marketed in the next two weeks, under the name of Sterling Tankaps—replacement caps for car and truck fuel tanks. With an assortment of twelve types of Tankaps the dealer can fit the tank of any car or truck.

An investigation reveals that a surprising



number of gas tank caps are lost every day, largely through the carelessness of drivers or filling-station employees. The car-owner who drives away from the pump without his gas-tank cap is a ready customer for the dealer with an assortment of Sterling Tankaps.

Sterling Tankaps are machined from a light but unbreakable white metal alloy, finished in dull black, accurately threaded, and fitted with a gas-proof gasket.

OIL AND GREASE RETAINERS

The Woodworth Oil and Grease Retainers for Ford rear axles consist of two steel wire springs, one wound right hand and one left hand. These are slipped over the axle shafts inside the casings. One end of the spring fits tightly over the shaft, the other end is larger so that it fits loosely and lies on the bottom of the casing. As the wheel revolves the screw thread action of the springs keeps continually carrying the grease back towards the differential casings and so prevents its working out on the brakes, wheels and tires.

It is said these Grease Retainers have the great advantage of being very simple so there is nothing to get out of order. They are very inexpensive and very easy to install.

Packed a pair in a carton, with full instructions for installing.

Manufactured by Woodworth Specialties Co., Binghamton N. Y. to whom all inquiries should be addressed.

NATIONAL LAC-VAR RESTORES THE FINISH

Lac-var is a scientifically prepared liquid product, made of highest grade materials, elastic and transparent. More than a varnish. Made to wear, preserve and to beautify.

Lac-var restores the original color and finish and brings out dull lettering, stripes and decorations.

For automobiles, trucks, delivery cars, motor boats, shop and farm machinery and vehicles of all kinds.

For many uses in the shop or store, the city and the country home.

Lac-var gives a hard durable coat with a lustre and brightness that is refined and beautiful.

One hour after applying, it is dust proof and dries thoroughly over night.

When dry it presents a pliable, mirror-like surface, which will not crack nor check, and is absolutely unaffected by heat or cold—and unharmed by mud, water, oil or gasoline.

Lac-var your car and it will add many dollars to its value in selling or trading.

Special Note—Lac-var is Not a mere polish, paste or wax preparation.

The importance of this amazing discovery can hardly be overemphasized.

It means a genuine paint protection and restoration of color and lustre to every car on which it is applied.

It means the elimination of "expensive repainting."

It means a greatly increased resale value. National Lac-Var is a transparent liquid which is quickly and easily applied with an ordinary brush.

Quarter Gal. Can, \$2.50—Half Gal. Can, \$4.50. Order from your dealer—If he cannot supply you, order from The National Automotive Mfg. Co., Champlain Ave., N. W. Cleveland, Ohio.

WICACO SCREW AND MACHINE WORKS, INC.

Wicaco means just two things, in the language of the American Indian, "a pleasant place," and in the language of good merchandise, "a pleasant product."

It is said the kind of products they make must measure up to their "pleasant plant" and to their "pleasant customers" with whom they maintain "pleasant relations."

We bring to your attention—with their advent into the Automotive business—Wicaco Twin Cut Piston Rings with the wandering oil groove, made of a close grained individual iron casting, machined to micrometrical correctness; assuring to customers the fulfillment of piston ring requirements.

It will be worth your while to know more about this product; write to Wicaco Screw and Machine Works, Inc., Stenton Ave. and Loudon St., Philadelphia, Pa.

ANNOUNCING

John S. Shirley, recently appointed advertising manager of the "X" Laboratories, manufacturers of "X" Liquid, has been in the advertising field for the past fifteen years; twelve years of which were spent with the Percival K. Frowert Company of New York and Philadelphia, during which time he served as copy-writer, rate and plan executive, special account representative and general manager.

The entire campaign of the "X" Laboratories is in the hands of Mr. Shirley, and an extensive magazine, newspaper and trade paper schedule is being planned for the ensuing year, supplemented by color advertising in the bill-board and window-display fields.

"LITTLE GIANT" PIPE WRENCH PRESENTED TO THE TRADE

The "Little Giant" Pipe wrench, a new wrench with several interesting improvements has just been put on the market. The "Little Giant" wrench has the "end opening" feature which is familiar to users of machinists' wrenches. Its application to pipe turning can readily be seen by a glance at the accompanying picture.

The advantage of the "Little Giant" wrench over the conventional style is the ease with which it can handle pipes in corners, close to walls, and similar confined places.

The person using it can set it straight on the pipe as he would a pair of pliers, instead of having to fit the jaws on from the side.

The "Little Giant" wrench has only three parts; a handle and jaw in one piece, which is drop forged and heat treated; a movable jaw, likewise drop forged and heat treated and a hardened steel nut. There are no springs, rivets, frame or pins, all these parts being eliminated. In spite of the absence of springs the "Little Giant" wrench takes hold and releases instantly at the option of the user.

The new wrench has been designed for maximum strength. The 14" size has repeatedly withstood stresses in excess of 4700 inch pounds without slipping or bending. Readers familiar with government requirements will recall that the army and navy departments require a test of 2800 inch pounds for a wrench of this size. Yet owing to the elimination of extra parts the "Little Giant," in spite of its extra strength, weighs less than a Stillson type wrench of corresponding capacity. This is an advantage to users and dealers alike.

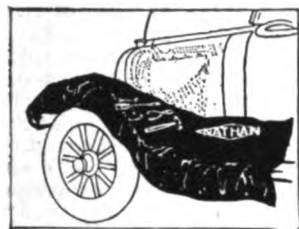
Another feature is the double set of teeth on the main jaw. The movable jaw can be engaged at the option of the operator with either of these sets of teeth with consequent lengthened life. On the large sizes, 14" and greater, two additional sets of teeth are provided, making four in all, and the movable jaw can be reversed to engage these additional sets of teeth, which are below the adjusting nut. This is very useful in connection with certain classes of work, besides practically quadrupling the life of the tool.



The new wrench is a product of the Greenfield Tap & Die Corporation, Greenfield, Mass. "Little Giant" is one of their trade marks, well known throughout the trade to all users of Screw Plates, Taps and Dies. The new wrench will be extensively advertised by its manufacturers.

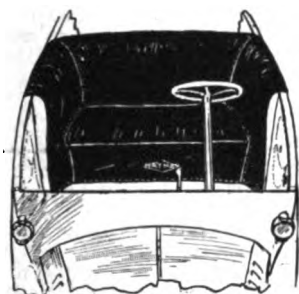
DELIVER CLEAN CARS

When your customer calls for his car, which has been in your shop for repairs, deliver a car that is **CLEAN**—as spick and span as you can make it—**INSIDE** and **OUTSIDE**, because your customer's first impression, when he sees his car, is what



counts. "**Keep Kar Klean Kovers**" are water and grease proof—guaranteed fabric—strong and durable—one size fits all cars. These covers allow the mechanic to work in and around the car freely and saves his time in the bargain.

The mechanic is more than glad to have



the car he is working on protected from dirt and grease because he knows a good repair job isn't enough—the car must be delivered clean or all his efforts toward good repair work have gone for naught. The price put on these covers is remarkably low—they are not an expense but a profitable investment. Address all inquiries to Nathan Novelty Mfg. Co., 55 Fifth Ave., New York City.

WEAVER MFG. CO.

Every day in the average repair shop countless jobs arise which require the use of a press. A few minutes saved on each job means a saving of hours at the end of the week and a decided increase in profits. To meet this demand for greater speed, especially on work that does not require extreme pressure, this new Rack and Pinion Feature has been developed.

This new feature together with many others which have made the Weaver Press so popular with garagemen in the past, all of which have been retained, make this new Weaver Hi-Speed Press the most efficient press for garage work on the market.

The extreme simplicity of construction of the rack and pinion is shown in the large illustration in the upper left hand corner of the page. The pinion to which the lever handle is attached meshes into a sleeve over the Press screw. This sleeve is attached to the thrust bearing plate so that by operating the lever handle to the right, the hand wheel and screw are lowered as a unit approximately 2 inches.

This construction avoids throwing undue strain on the screw which would occur if the pinion operated directly on the threads of the screw. A heavy tension spring counter-

balances the weight of the hand wheel end screw and greatly facilitates operation of the lever handle.

Where a comparatively light pressure up to 2,000 lbs. is sufficient, the rack and pinion can be used. Delicate work can be handled to special advantage with this leverage, as the operator can quickly feel when the right amount of pressure has been reached.

Should it be necessary to exert a greater pressure than can be supplied with the rack and pinion, the screw can be instantly spun down into contact with the work by means of the hand wheel and the ratchet lever thrown into engagement, as shown in the lower cut at the left. This ratchet arm has two adjustments which provide leverages of 1,500 to 1 and 3,000 to 1 respectively.

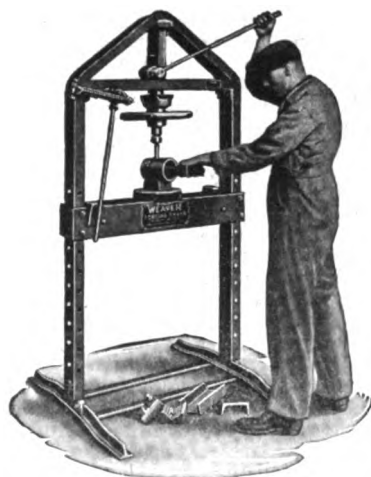
Thus work requiring pressure from 1 pound to 60,000 lbs. can be handled by this Press in the most advantageous manner and without moving the work after it is properly placed in position under the screw.

Every mechanic will appreciate the great convenience and saving of time afforded by being able to complete the job, whatever pressure is required, without having to move it from a small arbor press to a heavier screw press, or vice versa, as is usually necessary. The innumerable jobs arising daily which require the use of a press em-



phasize the importance of this time-saving feature.

For the usual run of work the regular Press, 32 inches between uprights, is amply

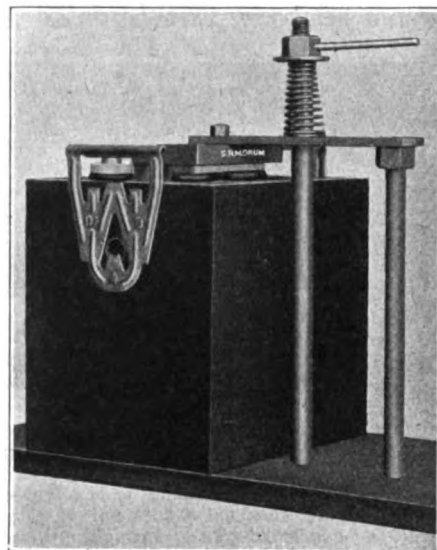


wide. Extra wide Presses, 42 inches between uprights, similar in design and possessing all of the above mentioned features, can be supplied at a slight additional cost.

Address all inquiries to Weaver Manufacturing Co., Springfield, Ill.

NO. 6 HOT RIVET POST SEALING MECHANISM

Metals have their characteristic peculiarities the same as men. Often one is compelled to select the best metal for a purpose. Other times one is compelled to select a method of using a predetermined metal to get a certain result.



A storage battery must have a lead post. The metal-lead's weakest point is its lack of tensile strength. Lead can not be drawn under the punch press, neither can it be turned or threaded without the surface becoming torn. Don't expect a fine thread cast on lead to stand a strain unless a thread is cast right, in accurate molds it is impossible to clean it up to size and shape with a die.

S. R. M. Orum, Inc. have a seal designed with the characteristics of lead carefully taken into account.

A soft washer that will take a compression is made of such a shape as to fit the well of the cover one desires to use. A flat washer can be with a well-less cover. The connector is put on and the compression mechanism is used to force the connector down on to the washer. Then while under compression the connector is burnt to the post through the holes in the hold down plate.

When the joint is cool, which only takes a few seconds, the pressure is relieved from the plate but the washer is still held under compression just as two parts of a bridge or boiler are held securely together by the rivets even after the rivets are cool.

The machine shown is for 13 plate connectors only. But the service station type of machine No. 6.1 will take any length connector as well as the terminal post.

In the factory type No. 6.2 the pressure is applied by foot power or air.

If our readers will write to S. R. M. Orum, Inc., 503-505 N. 11th St., Philadelphia, Pa., they will gladly quote on machines of different capacities.

JAMES A. BENNETT, SALES MANAGER

Mr. James A. Bennett has been appointed Sales Manager of the Connecticut Telephone & Electric Company, Inc., to succeed Mr. C. E. Stahl.

Mr. Bennett has been connected with this Company for several years, and is well informed concerning its product and policies, and his advancement is a natural result of his consistent and faithful work in the various departments of this organization of which he has been in charge.

"NAROD" TWIN-LEADER

Is designed to furnish an automobile with the security and driving advantages of correct headlight control. It seems to accomplish its purpose in this and what is most gratifying indeed is that it accomplishes this purpose with an article that is decidedly compact and classy.

It replaces the headlight door band of standard headlights. To install it one is



only required to slip off the old band, place the main lens in the twin-leader and then slip that on in place.

The back of the small lamp is removable and carries the socket and connections. The wire is concealed and brought down through the main headlight. The twin-leader can be removed to change lamps, etc., exactly the same as the present door band. The wiring is designed so that it does not interfere.

Two or four cp lamps can be used according to the wish of the driver. The



small searchlight lens concentrates the light into a column or "spot" and this "spot" is adjusted to a correct diameter and focused on the road at about 25 feet and assured a positive glare proof driving light. Exactly the requirement for city driving and for busy country roads as well eliminates the dangerous uncertainty of driving with dimmed lamps.

It is technically designed to be non-glaring in the rain. The volume of light leaves the centre of the small lens in a beam not larger than a dime. There is little chance of diffusion on the lens and the reflection and atmospheric rain drop diffusion are dissipated in small diameters.

Any standard headlight lens may be used with the "narod" twin-leader. The small searchlight lens of the twin-leader takes care of all ordinary driving requirements.

It also carries a parking lamp feature. In the back of the small lamp is mounted a one inch red lens that will serve this purpose excellently. It would have the advantage of full head on parking lights and visible red on either side of the car.

Made entirely of pure "narod" silvo-aluminum, is tarnish-proof and rust-proof, (not

plated and can be kept beautifully polished with any good metal polish.

The designs are conceived and passed by artists to harmonize with the car, its fittings and ideals. It is a beautiful ornament vitally practical.

Dodge style illustrated now ready for delivery. List price \$12.00 pair. Address all inquiries to Doran Engineering and Supply Company, 503 North Tenth Street, Philadelphia, Pa.

**"ARMOR" BUSHINGS**

There have been rumors in automotive circles for some time that the American Bronze Corporation, of Berwyn, Pennsylvania, best known to the industry as the originators and manufacturers of Non-Gran Bronze, were soon to place something new on the market. Announcement of this new product—the "Armor" Bushing—has just been made public.

The "Armor" Bushing is really a new idea. It combines a steel jacket with a hard bronze lining, so locked together that there is absolutely no chance of their working loose. The result is a unit product, complete in itself, combining the strength of steel with the bearing characteristics of bronze.

One most important feature, that has an immediate appeal for reasons of both convenience and economy, is the complete elimination of the necessity of broaching or reaming after assembly in spring suspension bushings. Once pressed into place, the "Armor" Bushing is ready for service. The contraction of the bore for a given press-fit is constant and can be definitely pre-determined.

This new bushing is ideal for spring-eye and shackle duties to which service the manufacturers announce the initial production will be devoted. It has, however, remarkable possibilities in other ways.

"The 'Armor' Bushing is by no means an accidental development," says Mr. Edwin G. Anderson, President of the American Bronze Corporation. "On the contrary, it is one of the results of an extensive investigation into and analysis of the essential characteristics of bushings. In the course of this investigation, the importance of the following characteristics were impressed on us more and more thoroughly.

"A bushing should be a complete unit, self-contained and not depending on any surrounding structure to give it stability or form.

"Bushings should possess mechanical strength sufficient to withstand without deformation all stresses incident to manufacture and installation, as well as any stresses to which they may be subjected in service.

"In order to resist wear, the bearing surface should be of a metal different in character from that of the journal and as hard as is permitted by the inherent characteristics of the installation, lubrication, pin hardness, deflection, etc.

"In addition to these characteristics, a bushing should be inherently economical to manufacture and install.

"A consideration of the conditions peculiar to spring suspension bushings led to the 'Armor' Bushing, a type especially desirable for such duties, although obviously by no means confined to them.

"These are composite bushings consisting of a steel shell into which is locked securely a hard bronze lining or wearing surface of greater thickness than the permissible wear before replacement and much harder than the usual cast bronzes. Such bushings are complete, self-contained units. Their mechanical strength obviates installation difficulties and the contraction caused by pressing into place is reduced to a small and pre-determinable amount; an amount which may be compensated for during the manufacture of the bushing. In other words, these bushings are ready for service after installation without any subsequent broaching or reaming. This statement applies to replacement as well as original installation.

"Taking into consideration the desirable characteristics of the bushing and the lessened assembly difficulties, costs of such bushings are even more satisfactory than is revealed by a price comparison alone.

"Frankly, we believe this product to possess such desirable characteristics for certain well defined duties as to merit very serious consideration."

E. C. BRANDT APPOINTED WORKS MANAGER OF NEW WESTINGHOUSE PLANT

E. C. Brandt, Works Manager of the Westinghouse-Krantz Works, has been appointed Works Manager of the new plant now being erected by the Westinghouse Electric & Manufacturing Company in Homewood, Pittsburgh.

Mr. Brandt was born in Tarrs, Pa., in 1887. He attended grammar and high school in Greensburg, Pa., and received apprenticeship training from 1902 to 1904 with the Kelley and Jones Company of Greensburg. In 1905 he entered upon the mechanical



training course of the Westinghouse Electric Company and in 1907 began work for the company as a general mechanic and small tool designer. Since then he has held a number of important positions, among which are General Supervisor of Machine Tool Demonstrators, Assistant Director of Manufacturing Operations and Supervisor of Equipment and Methods. He was Works Manager of the Krantz Manufacturing Company from 1921 until his recent appointment.


Mr. Brandt is a member of the Western Pennsylvania Engineering Society and has written articles for engineering magazines and delivered a number of papers before engineering societies.

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Pliers Smith & Hemenway Co., Inc.	3				
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ONE OF 50 KINDS

"More Service"
"Less Cost"



COMPLETE 1 CYCLE ONE HEAT


Makes any repair 2 1/2 to 5 1/2 Tires

Boiler Gas \$167.
Gasoline \$168.
Live Steam \$129.

Established 1894
CHAS. E. MILLER
Anderson Rubber Works
1406 Meridian St., Anderson, Ind., U.S.A.

BEARDSLEY

Hi-Speed Valve Grinder



It will clean up the worst set of pitted valves in record time. It comes packed in a handy wooden box with a slide cover. A long and a short shaft, special Ford bit, slot bit, adjustable bit, and a small can of valve grinding compound completes the kit. Nothing can touch it for smooth, clean work. Price only \$2.50. Don't put it off—get yours today.

LOOMIS BEARDSLEY MFG. CO.
1116 Mt. Vernon Ave., Columbus, Ohio

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AMERICAN AUTOMATIC DEVICES CO.

Every Motorist is a Prospect for KLEANALL WINDOWSHIELD WIPER

It answers all demands for clear sight for simple handling and good looks. Adapted to all cars. A few sweeps across the shield protects your vision through a heavy storm of rain or snow. Spring brass, nickel-plated. Easy to install. Retail for \$2.50.

Progressive dealers and their best trade know that this company stands foremost among makers of those "Accessories" which are NECESSITIES to safe, careful driving.

Our line includes, also, a type for every car and every purse. Retailing at 60c and up. See your jobber or write us.

We manufacture 76 varieties of automotive devices.

AMERICAN AUTOMATIC DEVICES CO. CHICAGO

DURO PLATES

FOR BATTERY BUILDERS

To meet the demand of battery stations who are called upon to build up starter batteries the "Duro" line of plates have been developed. "Duro" plates are made with the same high grade materials and workmanship as used in "Titan" plates. Tonnage production enables us to quote attractive prices.

GENERAL LEAD BATTERIES COMPANY
Chapel Street and Lister Avenue, Newark, N. J.

"HEXALL" SOCKET WRENCHES

"BABY" Hammerless Receivers

R. F. SEDGLEY, Inc. Est. 1897
2341-12-15 North 16th St. Phila., Pa.
Pacific Coast Representatives: San Francisco, Cal.

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**If You Want Business
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1923

Automobile Dealer and Repairer

THE MECHANICAL MOTOR MAGAZINE

THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 16-22 Hudson Street - New York City

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Vol. 34, No. 6.

FEBRUARY 1923

Monthly \$1.50 per Year
Single Copy 15 cents



The Better Way — VULCANIZE Your Tube Repairs

IT'S EASIER than sticking on a temporary cold patch, because the **Shaler 5-Minute Vulcanizer** makes permanent, heat vulcanized repairs that will not come off—stronger than the tube itself. No cement—no gasoline—no flame. Simple, sure, safe, satisfactory.

Over a million motorists carry the simple **Shaler Vulcanizer** for emergency use in making quick, permanent tube repairs—at home or on the road. Quicker than changing tubes. It's so simple that anyone can make perfect repairs. Just touch a match

to the solid chemical fuel. In five minutes the cut or puncture is repaired—a heat vulcanized, permanent repair that will not come off, better than any temporary "stuck on" patch—stronger than the tube itself.

SHALER
5 MINUTE VULCANIZER

Demonstrate the Shaler to your customers. Make frequent demonstrations of the **Shaler 5-Minute Vulcanizer** in operation. Display the vulcanizer on your counter with an old tube full of cuts and punctures, clamped in the vulcanizer ready for a Shaler Vulcanized repair. When a customer comes in to make a purchase ask him to let you show him the **Shaler 5-Minute Vulcanizer** in action. He will be pleased with the simplicity of operation—and satisfied that a Shaler Vulcanized repair is better and easier than patching.

ogle

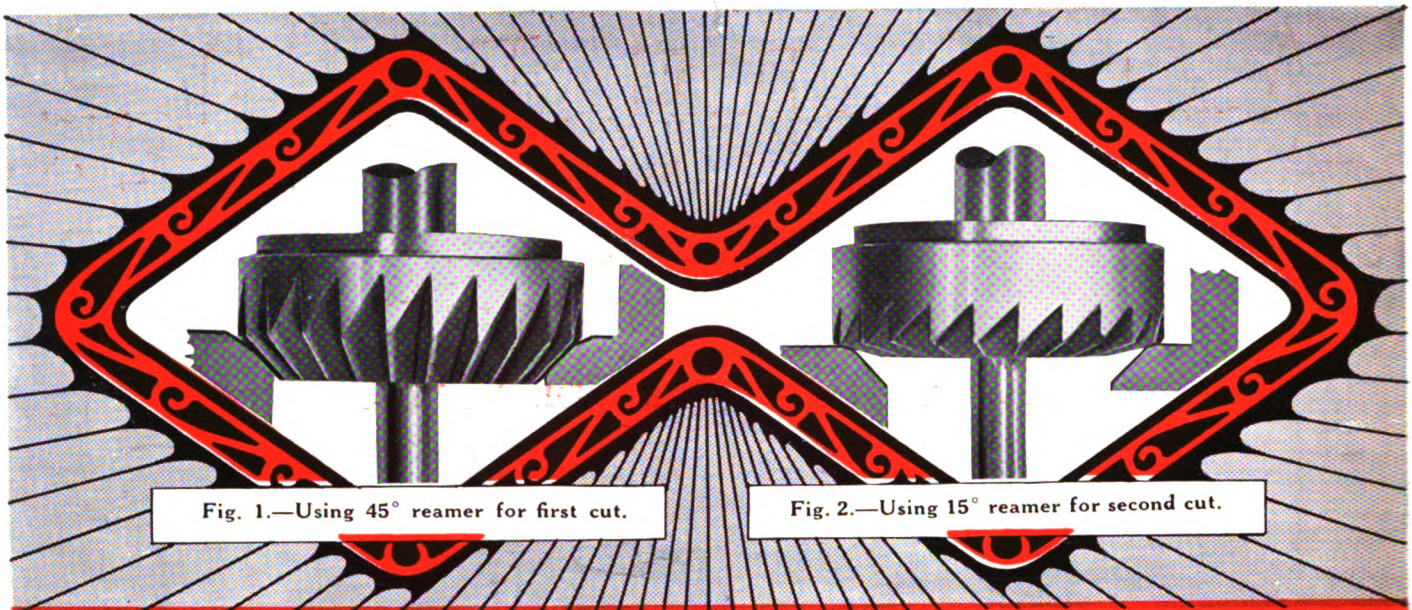


Fig. 1.—Using 45° reamer for first cut.

Fig. 2.—Using 15° reamer for second cut.

How to Reface Valve Seats for More Accurate Fitting

IN reaming valve seats mechanics often find difficulty in centering the reamer over an uneven guide hole.

When this happens it is necessary to recut the valve seat to get it into alignment with the hole. Then, after reaming a second time, it is usually found that the seat has been reamed so far that it is too wide for a good tight seating of the valve and often with a bearing surface wider on one side than on the other.

This difficulty is avoided, and a quicker and more accurate job obtained, by proceeding as follows:

Make the first cut at 45° in the ordinary way with the Sioux Valve Seat Reamer. (See Fig. 1.) Then take a 15° Sioux Reamer and bevel off the top of the valve seat as shown in Fig. 2. Work down until the **lower** line of the 15° cut measures a little below the outside diameter of the valve face.

Now take your 75° Sioux Reamer and reface the lowest

part of the valve seat as shown in Fig. 3. Cut down until the **upper** line is a little above the inside diameter of the valve face.

Your valve seat will now appear as shown in Fig. 4, and in absolute alignment with the guide hole. It is now perfectly centered and the proper width for most lasting results. The 15° and 75° reamers can be used with the same results on the 30° or 60° valve seats.

All possibility of chattering of valve seat is prevented simply by inserting a piece of 50 lb. wrapping paper, large enough to cover valve seat, on the stem against cutting points of reamer. Write for free sample.

When ordering 15° and 75° valve seat reamers the 15° should be the same size as the valve head, and 75° in most cases should be approximately 1/8 inch smaller.

Any size 15° and 75° Sioux Reamer may be obtained at the same prices as corresponding sizes of 45° reamers. Write for catalog and valve seat reamer specifications.

ALBERTSON & CO., SIOUX CITY, IOWA

Your Jobber Sells Them

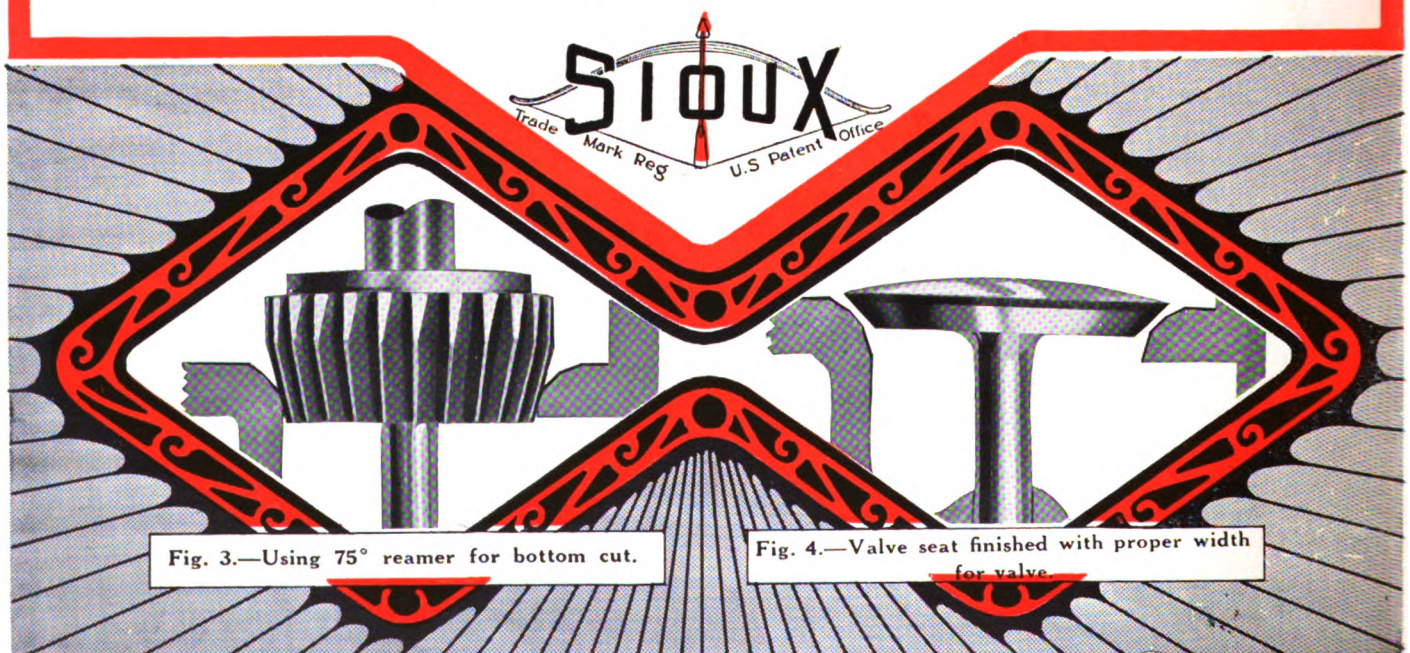


Fig. 3.—Using 75° reamer for bottom cut.

Fig. 4.—Valve seat finished with proper width for valve.

Automobile Dealer and Repairer

The Mechanical Motor Magazine
Registered in the U. S. Patent Office

Vol. XXXIII No. 12

FEBRUARY, 1923

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Boston's Twenty Second Auto Show March 10th to 17th

**Every Inch Of Display Space In Mechanics Building
Will Be Filled—More Closed Models A Feature,
With Accessories Calling For Additional
Space**

JUST now the great New England public is anxiously marking time, waiting expectantly for two things—the passing of winter and the coming of the twenty-first Annual Boston Automobile Show, to be held in Mechanics Building, from March 10th to 17th with the Salon to be held in the Grand Ballroom of the Copley-Plaza Hotel, from March 12 to 16.

Mark Twain had his little joke when he said that Boston has no climate, just weather. But times have changed, and in the last twenty years the Automobile Show is official notice that spring comes at the same time, and with it the touring season, car manufacturers, Accessory men, and tire men, and all those connected with the great industry, also show great enthusiasm when the dates of the Boston Show are sent out; for them it means that the greatest of all seasons for them—the selling season—will soon be on.

The one big thing about the Boston Show is that it is seasonable in every sense of the word. The dealer will tell you it is the selling season; and the buyer—if you don't believe it, watch him—will tell you by his very actions that it is the buying season. He knows that by the time March has come around every car manufacturer will have completed his line for the year so that he can buy without fear of seeing something better come out later. The various shows throughout the country from the first of the year down are interesting, but somehow the Boston Show each year carries the reputation of being the biggest and the best, and the last word in models and styles.

Reports from the office of Chester I. Campbell, manager of the Show, indicate that this year the five great



CHESTER I. CAMPBELL, Mgr.
Boston Auto Show

halls and the endless runs of balconies and general exhibition spaces, will be crowded to the limit. Not only will there be more makes of cars shown than ever

before, but the several other exhibits, especially the accessory line, will be far greater than any previous year. Only a short time after the closing of the New York Show, Manager Campbell received a request from the Motor & Accessory Manufacturers' Association that this year the accessory men would require at least 25% more floor space. Explanation of this, of course, lies in the fact that while manufacturers have been turning out more enclosed models, and adding greatly to their attractiveness they have had to look to the accessory men for the countless little things that go to give a car better appointments.

chassis, with parts cut away to show the insides, will be much larger; they will be in operation too, and everybody will be able to see just how the thing works. The Management has laid considerable stress upon this feature as being helpful to the dealer.

It goes without saying that the Boston Show will have some cars that never before have graced the floors of an exhibition; there are always a few which make their debut in this town. Also there will be the very latest models from manufacturers whose final designs are under construction during the other big shows. This is always true for within a few months of the closing



Mechanics Building—Home of Boston Automobile Show
March 10th to 17th

There is as yet no indication as to exactly how many makes of cars will be on the floor of the Boston Show. The number will be limited only by the capacity of Mechanics Building, plus the ability of the management to juggle the floor plans until as many as possible of the applicants have been satisfied. Perhaps there will be 90 different makes of passenger cars, and about 40 makes of trucks, to say nothing of the fire apparatus, the farming apparatus, and the little things that are motor driven.

As if to make the show more educational in value, so that the motorist and the man who expects to own a car may know that an automobile is being shown, it will be noticeable this year that the number of stripped

of the Boston Show the plants of many of the more progressive makers will be working on the models for 1924.

Among the newcomers this year will be several sixes which will attract more than ordinary interest, because they are the products of concerns which have made their fame in the production of highly developed fours. For the present at least, these makers will keep up production on their fours. The sixes will be of lighter type.

Advanced ideas in body construction will be the strongest feature of the show, with the enclosed models for the big drawing cards. This is in keeping with the general trend to put out an all-year car of comfort, for

which there is a constantly increasing demand, especially in this section of the country. The large numbers of body styles ranging from two to seven passengers, in coupe, sedan and limousine form with the various types selling under other names—some with two doors and some with four, will give the buyer the greatest field of selection ever shown in the history of the industry.

Special paint jobs, special equipment, special designs that are almost personal to the man who is looking for the exact car he wants, will be a feature. Better cars at lower prices seems to be the idea of the makers.

The salon which will be held in the Copley-Plaza Hotel, will as usual be something a little bit special—it will show the aristocrats of the foreign field, well as the best products of American manufacture. The grand ballroom of the hotel will be opened at 1 o'clock each day, and remain open until midnight for the five days of its run. It may be safely said that when the Salon opens the public will be treated to the best display of alien cars that ever came to this country. New ideas in both chassis and body designs are to be shown, some of which are said to be more advanced than the work of some of our own engineers. Interior finish, equipment and those little appointments that make for greater comfort and the last word in completeness, are certain to maintain the fame of the continental designers, who seem to have a better understanding of the word luxury as applied to travel.

Helping the Motor Cop

MAKING auto license tags legible at night is the object of a series of tests conducted by the Bureau of Standards of the Department of Commerce in cooperation with the Society of Illuminating Engineers. It is hoped, the Commerce Department says, that as a result of these tests it will be possible to establish a practical standard of illumination for these tags so that they will be readable at night as well as in the daytime at a reasonable distance.

The tests are made by mounting the tag at a known distance, turning on the light, and seeing if the observer can read the number correctly. If he hesitates and corrects himself the tag is taken to be illegible under those conditions, as under normal road conditions there is no time for a close examination. A number of employees of the Bureau are used as observers so as to get an approximately average result.

In the first test the tag is illuminated by lamps so arranged as to give the best possible readability. This establishes a standard. It is then possible to compare this ideal condition with the actual illumination given by any tag illuminator now on the market, to see how much they fall short, and to suggest ways in which they might be improved. The illumination given by many of the types now on the market is purely nominal. A spot of light is thrown on one corner of the sign and that is all.

The apparatus also permits of various angles between

the surface of the tag and the light and the eye. The best angle at which to mount the tag can therefore be determined.

A comparison is being made of the relative readability of different color combinations. It is well known that certain combinations are more easily read than others and it is hoped as a result of these tests to give some definite data on this subject.

One curious result of these tests might be mentioned. As the numbers are raised and cast shadows, it was expected that a white number on a dark background would be more easily read than the opposite combination. Experiment showed, however, that the dark letter on white was much the more easily read. This is probably because the larger expanse of light enables the eye to see more distinctly.

In certain special classes of cars letters are used on the tag in addition to the numbers. It has been found that only about four or five letters in the alphabet are suitable for this purpose, the rest all being mistaken for numbers. B, for example, is mistaken for 8; H for 11, C for O, etc.

It is also planned to try out a tag in which the light is placed behind and shows through rows of small holes that indicate the figures. Different proportions of holes to solid area will be tested and the readability of tags of this kind compared with the usual kind.

Later the apparatus will be arranged so that it can be shaken to simulate the motion of an automobile on the road and the effect of this factor on readability will be measured.

Bureau of Standards Measures Effect of Local Action on Storage Plates

MOST automobile owners and others who use storage batteries are aware of the damage done to these batteries by impurities in the electrolyte or in the material of the plates. The exact amount of the damage done by a certain amount of impurities has not, however, been determined heretofore.

The Bureau of Standards of the Department of Commerce has now undertaken a series of tests to determine the effect of various impurities and the relation between the amount of the impurity present and the extent of the damage done.

The first of these, having to do with the effect of local action, has now been completed and the results published. Persons interested should write to the Superintendent of Documents, Government Printing Office, Washington, D. C., for Technologic Paper No. 225 of the Bureau of Standards entitled "A New Method of Determining the Rate of Sulphation of Storage Battery Plates," copies being 5 cents each.

This new method has been used for determining the rate of sulphation on positive and negative plates resulting from local action. It is rapid and accurate, whereas the methods formerly used were very slow and unreliable.

Getting Repair Work and Keeping the Trade

How Some Successful Small Town Garages are Building Business and Profits

BY J. H. MOORE

HOW often we hear the remark "never again, I just got my car repaired at Blanks. He SOAKED me \$85, and I don't believe it is any better than when I turned it in."

When a man makes such a statement it means he is SORE, displeased, disgruntled, call it what you may, and it also means that next time some other repair man will get the work.

The funny part of the whole thing is that often the statement is entirely uncalled for. Blank may have done a good job, charged only a reasonable price, yet because of his business methods, failed to convince the customer that he was getting his money's worth. In other words, he failed to get the customer's CONFIDENCE. Of course Blank may have SOAKED him. If so, we leave Blank out of the question, as there is no real remedy for dishonest garage owners. Besides, give them enough rope and they soon cause their own finish.

Our problem is that type of garageman who is really trying to do his best, yet does not seem to inspire confidence. Several things may be at fault. It may be the man himself. He may be that type who is a good mechanic, but a poor salesman, who cannot successfully sell himself and his business. Should this be so, and only a careful self analysis can prove this, then let him get back into the shop and leave the talking and arranging of repairs to one better suited to the task.

Yet a man can be a glib talker and yet not convince, thanks to the poor condition of the garage; nothing creates distrust quicker than a dirty and poorly kept place. If a man wishes to hang on to business, let him be neat and methodical. The customer may not take the trouble to say, "Jones, a nice place you have here, etc., etc.," but he is thinking it just the same and it is impressing him. He feels that if you are particular about the condition of your shop, you will likewise be particular about the quality of work produced.

There are other ways of showing your customers that you are looking after their interests, and while these ideas help you hold business, they do at the same time increase the efficiency of your shop, increase profits and keep the workmen up to the mark.

For example, take the idea shown in Fig. 1. Suppose you have a work assignment rack in the office of the nature shown. Perhaps you may want it in the shop, but this depends upon the size of the garage. When a

customer sees this in use, he knows you are handling your work methodically and that he will get his proper turn.

The workmen on the other hand are not held up wondering what job is next. Suppose the foreman is not right on the spot when a workman needs another job. He simply goes and takes the order in the lowest number of the rack and proceeds without delay. All necessary instructions are on the slip.

ANOTHER GOOD IDEA

Another idea which has been worked successfully is this: As a customer enters the door, the man in charge of allotting work ascertains his wishes, then assigns him to a numbered stall, at the same time pressing a button on a large electrically operated repair board. This board contains a number of electric lights of different color, the colors indicating the character of work to be done.

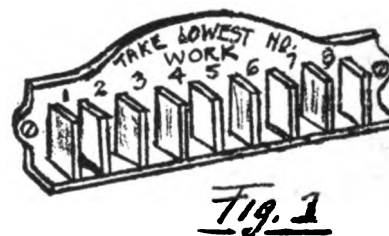


Fig. 1

Thus, no time is lost in giving verbal instructions. If the mechanic sees a green light at, say, stall 10, he knows the car needs battery replenishing. By the time the car is at the stall, or very shortly after, the machine is there with water and proper tools.

When the car drives out completed, another man collects the bill, presses another button and puts out the light on the board.

ADVERTISE YOUR WORK

Another good plan, is not to be ashamed of the work you produce, or be backward at making suggestions. Take the grocery clerk as an example. A housewife comes in for two articles, yet by suggesting other things she may need, he increases his sales and she feels pleased that he has reminded her of what she required.

For example, suppose you have been repairing Smith's car. His engine was out of order, yet you noticed that

the tires on his car were not in good shape. To suggest at the moment that he purchase NEW ONES would hardly meet with success, but make a note of it and as soon as he takes his car out of the garage, write him a nice personal letter, stating that you noticed that his tires were in bad shape, etc. The letter shown at Fig. 2, will bring results far beyond the most sanguine hopes.

Dear Mr. Smith:

While repairing the engine of your car, we could not help but notice that your tires need immediate attention to prevent accident or total loss. In fact the rear tire on the right is not worth repairing and should be replaced with a new one. We know you will not consider this suggestion an impertinence on our part, for we make it for your own comfort and protection.

We appreciate the business already placed with us, and feel it is our duty to call the matter of tire trouble to your notice. We would not like to hear of your being delayed on some important trip because of faulty tire trouble.

On looking over your tires we found that the repairing of the three tires, and the replacing of a new one would cost \$....., if handled by us. We know this to be a reasonable price and feel sure you will be pleased we called the matter to your attention.

We will give you a ring on the phone Thursday of this week, and talk matters over in detail. You already know the quality of our work, so we need not comment on the attention we would give you.

If you get puzzled over some question in relation to your car at any time, be sure to give us a ring, or drop in and see us. We want you as a personal friend as well as a regular patron.

We are

USE THE TELEPHONE OFTEN

Use the telephone often as a sales getter, but be sure you have something definite to say before you call up any customer. Don't merely say "How about letting us fix your car." This would be almost sure to fail. Rather discover what is wrong with Smith's car, then call him up and inject a little personal touch into the business by offering helpful suggestions. Business will then come as a natural course of events.

The value of good letter writing is amazing, but certain pitfalls MUST be avoided. Omit foolish and unnecessary introductions, stock phrases, etc., make letters brief and to the point. Have something definite to speak about. Be courteous without overdoing it. Let the customer feel the personal appeal. Do not tack on a conventional ending, such as "hoping to get your business, we are,"—but make the ending mean something. Fig. 3 shows a letter which has proved successful.

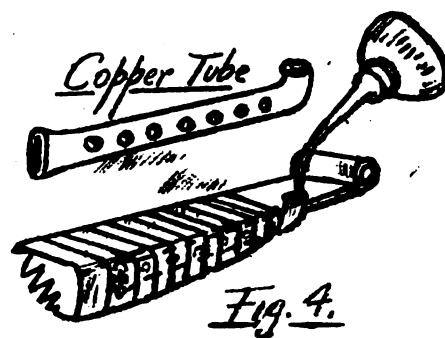
Then occasionally send them hints which may help them out of a hole sometime. Automobile owners will appreciate this sort of service and will remember where

it came from. The really successful garageman, is the one with the ideas that are out of the usual rut. During the winter season and early spring especially, you can often secure unlooked for business by planting the idea in some prospective customer's mind that some certain repair should be done. Always emphasize the fact that a "Repair in time may save nine."

As an example of what I mean by service, let me quote this incident.

Brown came into Blank's garage. "My springs squeak horribly," complained Brown.

Instead of saying leave it with us and we'll fix it, this man Blank did a seemingly foolish trick. He looked at the springs, noted their condition, then made a sketch as shown at Fig. 4, handing it to Brown saying, "Rig up your springs as I show here, and you will never have any further trouble. If we do it for you, it will cost more than I think you will care to pay, but the idea is so simple you can do it in your spare time some day."



Thus, seemingly he turned away a good profitable job, yet on the other hand, he made a friend who felt there was a garageman who did not squeeze the last cent out of his customers. Did that man come back? You bet he did and placed all his work where he had confidence.

Dear Mr. Smith:

Your friend, Brown, took his car out of our garage this afternoon, and said he was delighted with the way it ran. He was also good enough to say he would tell his friends about the manner in which we treated him, both for price and service.

We know you own a S——, and were just wondering how it was running? Brown has been a steady patron of ours for some time, and we appreciate his bringing his work to us, but we would also like to include you on our list of friends. We say friends advisedly, because every patron we have is a personal friend. We work together.

A few days ago we got in some special spark plugs which we can highly recommend. Brown got them put into his car, and is highly pleased with the results. The complete set only cost him \$..... It's a wise investment, because he will save more than the price of them in gasoline within a short time. How would you like a set on your car?

Feeling sure you will be interested in a detailed description of these plugs, we are enclosing a folder

showing their construction. We will give you a ring in a few days, to see how your car is running and perhaps may be able to offer you some help.

We got in a fresh supply of accessories the other day. Why not drop down and see them, when we can show you the new spark plugs at the same time?

We are

One could go on almost indefinitely suggesting ways and means of improving service, but local conditions have much to do with what methods are adopted. The principle is the same, however, no matter where the location.

"Treat customers as friends, not sources of revenue. By so doing, you get their confidence and also their business." A certain owner of a large plant having some 12 trucks and several cars, went to a certain garage to see if some arrangement could not be made whereby a steady service could be secured. He went into one large garage, asked to see the proprietor, but the doorman decided to play safe (?) "What do you want?"

"I want to place work," was the answer.

"Sorry, but we're filled right up," was the reply. Thus, an employee who, because business was good, got officious, spoiled a wonderful stroke of business. This story, which actually happened, proves the necessity of selecting help carefully.

In conclusion, the way to get business and to hold it, is to treat every customer as you would like to be treated were you in his place.

Oxidized Kerosene May be Useful Fuel

THE solution of still another industrial problem has been undertaken at the research laboratories of Carnegie Institute of Technology, Pittsburgh, in experiments to determine the relative efficiency of kerosene and oxidized kerosenes as fuels.

In accordance with the policy of the Institute to link up its educational facilities with modern industry, the Department of Chemical Engineering has been conducting a series of tests to determine the relative merits of various oils as usable fuels. The completion of this important work should go a long way toward solving the problem of oil conservation, by the possible development of a new fuel.

According to a report by Dr. J. H. James, Head of the Department conducting the experiments, oxidized kerosenes cause less "knocking" tendencies than straight kerosene when used in a kerosene engine. The tests also show that oxidized kerosenes have approximately the same power development as ordinary kerosene, in spite of the fact that their thermal value is one-eighth less. Dr. James attributes the efficiency of the oxidized kerosenes to the better "clean up" in the combustion of these partially oxidized fuels.

The success of the experimental work at Carnegie at this stage gives promise that oxidized kerosene, which is

manufactured by catalytic oxidation from low-grade petroleum, may become a useful fuel in the future. Its properties may cause it to be used industrially in kerosene engines or blended with gasoline for use in gasoline engines. Although it has a somewhat lower fuel value than ordinary kerosene, one of the most favorable features of its effectiveness is that it undergoes much better combustion in the internal combustion engine.

FACTS AND FIGURES

of the Automobile Industry for

1922

by

Alfred Reeves, General Manager

NATIONAL AUTOMOBILE CHAMBER OF COMMERCE

PRODUCTION

Cars and trucks.....	2,527,000
Cars	2,287,000
Trucks	240,000
Previous record motor vehicle production (1920)	2,205,000
Number of new cars needed for replacements in 1923.....	1,800,000
Production of closed cars.....	35%
Total wholesale value of cars and trucks..	\$1,558,567,000
Total wholesale value of cars.....	\$1,374,487,000
Total wholesale value of trucks.....	\$184,080,000
Estimated average retail price of car 1921..	\$900
Estimated average retail price of car 1922..	\$770
Reduction in average retail price of car...	14%
Estimated average retail price of truck 1921	\$1,326
Estimated average retail price of truck 1922	\$1,050
Reduction in average retail price of truck..	21%
Tire production.....	36,340,000
Number of persons employed in motor vehicle and allied lines.....	2,431,400

REGISTRATION

Motor vehicles registered in U. S. (approx.)	11,500,000
Motor cars.....	10,250,000
Motor trucks.....	1,250,000
Increase in U. S. registration over last year	7%
World registration of motor vehicles.....	12,750,000
Per cent of world registration owned by U. S. A.....	81%
Motor vehicle registration on farms.....	3,500,000
Motor cars.....	3,300,000
Motor trucks.....	200,000
Motor cars serving suburban communities	780,000
Passengers carried annually by motor car..	7,500,000,000

What Jones Did to Clark's Business

The Ups and Downs of a Small Town Garage—Practical Lessons for the Small Town Garage Owner— With a Fighting Spirit

BY GEO. RICE

THE type of brakes carried in stock in the Clark garage and repair shop were no better than any other kind of brakes. But Jones decided to advertise the brakes as if they had certain points of advantage over the regular kind. He put an advertisement in the local press of sufficient size to warrant the publishers allowing the insertion of a reading notice and both the advertisement and the reading notice elaborated not only on the special merits of the brakes, but warned automobilists of the danger of operating their brakes when out of order. The trend of his advertising in the press and by means of type-written letters was an inducement to the autoists to take their cars or trucks to the Clark shop for inspection and adjustment of the brakes if needed. The advertising was headed with the line, "Are Your Brakes in Working Order?" This line was followed by "If not, see us." Then followed the details of the style of brake recommended and the location of the shop. Out in front of the shop itself a sign was placed carrying the above caption in large black letters on a white ground so that all could see in passing. In the show window of the sales department Jones placed several illustrations to attract notice of autoists who might be in need of new brakes or repairs to the old ones, and these illustrations pictured some possible accidents resulting from careless pedestrians crossing a street in front of moving cars, and the essential need of effective brakes in such emergencies.

Some placards demonstrated the standard regulations of brake service and showed in figures at just what distance a car going at a certain speed must travel before the brakes can check it.

The illustrations were drawn with black crayon on white card board, each of ample size to make the figures visible from the street. One illustration showed a woman crossing the street in front of a moving car, holding a small lad with one hand and a bag with the other. The woman pulled forward and the lad backward with the result that the pair were practically halted directly in front of the car. The idea of the illustration was to call the attention of automobilists to a form of accident which might arise at any crossing under similar circumstances and for that reason the brakes of the car should be in perfect operating condition.

EFFECTIVE BRAKES NEEDED TO AVOID HITTING SOMEONE RUNNING FOR A CAR

All autoists and truck drivers have had their thrills when they have stopped their cars or their truck just in time to avoid running down some careless person who runs straight from the sidewalk through the street traffic

for the purpose of catching the hand-rail on the rear platform of a moving street car. Usually the person attempting the dangerous run has his eyes and attention fixed solely on the rear end of the street car. He does not look either to the left or the right very much. He has it in mind that he must board that car. Nothing else matters for the present. When men or boys hastily and suddenly leave the sidewalk between the regular crossings for this purpose, the alertness of the oncoming autoist or truck driver and the effectiveness of their brakes are what count. The person is usually going full speed and may not be able to stop in time even when he tries. The picture of a man racing from the sidewalk for a passing car, and an automobile almost on him, helped to call the attention of autoists to the need of having their brakes in good order.

The picture showed the street car, the man hurrying for it, and the automobile almost on him.

MEETING AT A CROSS STREET

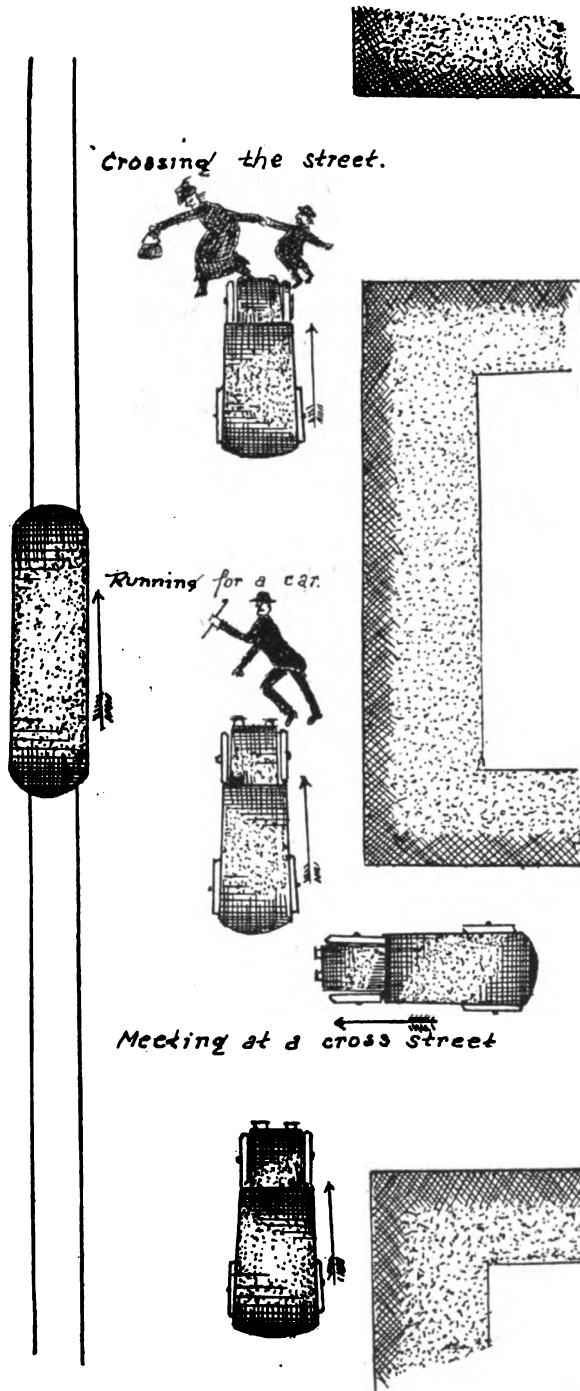
Another illustration calculated to interest autoists in the condition of their brakes consisted of a drawing of a street crossing not important enough to have a policeman stationed there to direct the traffic. The illustration showed a car coming in from the cross street just in time to almost collide with a car travelling on the main street. Of course, all autoists and truck drivers use precaution at crossings of this character, and accidents do not happen often. But the idea of the illustration in the show window was to demonstrate what might occur in case the brakes of either car were out of order.

As a result of this method of advertising brakes and their need of effectiveness in case of unexpected emergencies, most of the brake stock was used in a few days and more ordered. Formerly but very little business had been done with brakes. There had been some repair service on defective brakes and a few new sets had been installed to replace worn out sets. But the business in brakes had not been very remunerative. In fact, no particular branch in the establishment had been remunerative. The back accounts revealed numerous losses without any corresponding profits. A number of newly patented contrivances for cars and trucks had been put in stock by Clark only to carry most of them as dead stock. One reason for this was that Clark had had a habit of putting aside instead of pushing the devices or the merchandise. There were standard gears, clutches, parts of motors, wheels, tires and all sorts of accessories hidden away in remote corners, in boxes, many unopened,

no attempt having been made to exhibit them or put them out where would-be purchasers could see them.

For the next few days the enterprising Jones devoted most of his time to opening up this hidden stock. Fine sets of automobile tools had been put away so long that

ARE YOUR BRAKES IN WORKING ORDER?



they were rusty and had to be marked down. These sets were put out where they could be seen and as the price

tags were marked far below regular value; and as the surfacing of light rust could be removed with oil and emery, all of the sets were sold. In each case the price ticket was marked with the statement that the article was sold below the regular price because of its damaged condition. Otherwise the buyers might expect the new sets put in later at the same reduction. The increased business in brakes and the sale of odd lots of automobile and truck accessories began to bring in some ready cash, all of which was encouraging to both Clark and Jones, although the former was still pessimistic and did considerable complaining. He objected to many of the plans put forth by Jones, but Jones did not heed, Jones had the receipts to show and as these had increased considerably over the receipts of former days, Clark could not claim that the new system of management had as yet failed. He looked for its disastrous end daily.

He spent much of the time in the office going over the accounts and fussing about non-payments of bills long since due. It was these outstanding accounts that Jones undertook to collect as his next move to put the place on a paying basis. The manner in which he went to work to get in money which had been due for more than three years in some cases will be referred to next.

Previous to the regime of Jones the promise to pay on the part of persons having work done in the shop, or rental of space in the garage, or the purchase of accessories, had been allowed. In the hustling way in which much of the automobile business is done in these days the rapidity with which money can be turned has more to do with the success of the plant than is usually supposed. This fact was realized by Jones who knew that the business was being handicapped by the fact that considerable money was tied up through the lack of a proper credit system and collection plan. He also knew that all money in someone else's possession was unserviceable to the business although it rightly belonged in the available cash assets. And cash in hand for the purpose of discounting bills and taking advantage of profitable bargains is worth while. Jones also knew that to abruptly change from a credit to a cash basis for all transactions in the shop, the garage and the sales department might be too radical a move at just that time, so he decided not to put up the sign of "Credit discontinued." But he decided to get in all he could of the outstanding accounts.

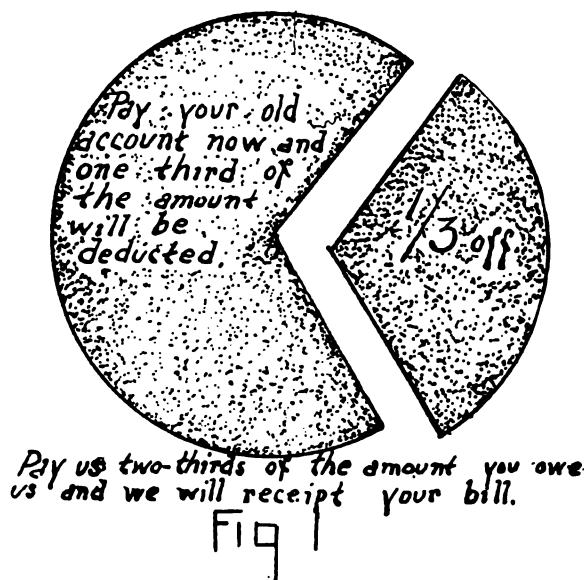
Jones learned from the bookkeeper that numerous attempts had been made to collect delinquent accounts. No one who owed had been permitted to forget. Statements had been mailed on the first of each month.

Not much attention was given these statements by the receivers and but few payments resulted. A few of the bad bills of customers who had left town were turned over to collection agencies but the returns were not satisfactory. An automobile or two had been attached in the process of collecting long standing accounts of wiley patrons, but this method did not appeal to Jones. In fact, Jones had an idea which he decided to try although when it was explained to Clark the latter strenuously objected for the reason that even if all the debtors made a settlement there would be a loss of one-third of the

amount due. So the matter dragged on for several days because of disagreement as to the plan. Finally the pressing need for ready money caused Clark to consent and the next day Jones had his plan under way.

A THIRD OFF ON OLD ACCOUNTS PROVES ATTRACTIVE

A letter was printed and mailed to every person who owed money and who was considered as not willing but able to pay. The letter outlined briefly the fact that if the enclosed bill was settled now a discount of one-third of the amount would be allowed and the bill receipted for



the entire amount. Persons who were regarded as good pay or who had recently started accounts were not thus notified, although they had the same opportunity for getting the benefit of the discount if they chose to pay within the specified time which was five days.

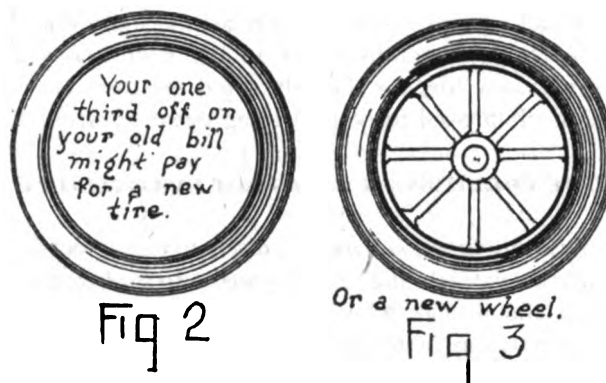
In addition to the letters and statements sent out by mail, notices to the same effect were published in the local papers. Some window display cards were made illustrating the one-third off plan. One illustration consisted of a piece of asbestos board, cut into a circle three feet in diameter, with a one third section cut out and placed a little to one side, thus representing the one-third deduction. The placard had the inscription of "Pay your old account now and one-third of the amount will be deducted."

This is shown in figure 1. Another card read, "Pay us two-thirds of the amount you owe us and we will receipt your bill." A tire was hung in the window with a placard reading "Your one-third off on your old bill might pay for a new tire," as shown in figure 2. Beside this tire and placard was placed a complete wheel and tire with the card, "Or a new wheel," as in figure 3.

Another combination was a tool chest and contents, carrying the announcement that "We can sell you a chest of auto tools for the $33\frac{1}{3}$ per cent you save by paying an old account of \$30.00," as in figure 4.

For the first day or two the scheme appeared to be a failure for only a few persons called or sent their checks

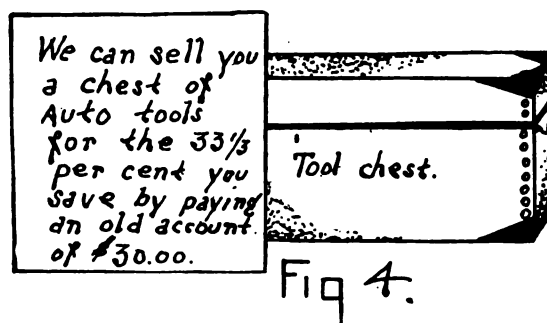
on the one-third-off plan to settle their accounts. On the third day the outlook was more encouraging, for a dozen or more made settlements, two of whom had been in debt to the garage for considerable amounts for over a year. To Clark, much of this money seemed like so



much velvet, for he had considered it as lost. On the third day he ceased criticising the plan. He had felt that some of the patrons would feel offended when offered an opportunity to get their bills receipted on a one-third reduction plan. But when they came in and expressed their regrets that they had overlooked the account and even apologized for the apparent oversight, Clark felt that the idea was not so bad after all.

On the fourth day there was a liberal collection of payments from persons who, in some cases, pretended they had forgotten to pay, or who thought they had paid, or claimed that they had never before received the statements which had been faithfully mailed to them the first of every month for many months past. All manner of ridiculous excuses were made.

But the money came in. That was the main idea of



the scheme. On the fifth and the last day the number of persons who came to pay long forgotten bills astonished even Jones. Over \$5,000.00 had been paid in since the beginning of the plan and its ending. Nearly as much more was represented by persons who still owed, but the idea had been the means of getting in sufficient ready money to avert an immediate bankruptcy. For the first time for a long period Clark appeared jovial. His fixed frown eased off. He even smiled as he counted out the bills, smoothed them, arranged them in order, and realized what they meant to the business. Firms from whom he had procured supplies for which he had not paid, and who were about to sue him, could now be appeased by

a fractional payment on the total amount due. Clark did not expect any of these firms to offer him a third reduction, as he had offered those who owed him, but he knew that he could establish the credit of his place once more with partial payments. The bookkeeper was elated, as he saw a chance to get his pay account settled, for he had been able to draw only a little more than half pay for several months. Out in the shop and garage there was new life, for the help could see their back pay coming. It proved to be a pleasing event all around.

THE CREDIT SYSTEM WAS NOT DISCONTINUED

But the credit system was not discontinued. Jones knew enough about cash and credit systems to realize that the man or the woman who has credit in an establishment will not only buy better goods but more of them than if he or she is obliged to pay cash. He knew that to be a part of human nature in the majority of people.

Credit patrons of a garage and repair shop, are, as a rule, good customers, and they are an advantage over cash customers, for they become regular customers and usually give all their business where they have a charge account. It is always easier to send a car to a shop for repairs where there is a charge account than to bother about sending a certain amount of cash in payment. It is easier for the person wanting an accessory to telephone for it and have it charged than to send an indefinite amount of coin for it.

Of course there are dead beats. Some travel in the best of society. Often they possess a high priced car and wear good clothes. Sometimes they come in and buy liberally of supplies, or have extensive and costly repairs made, and haughtily direct that the bill be sent in at the end of the month. After the bill remains unpaid for some time, an investigation reveals that the fine car was procured for a small instalment, and the supposed elite of society are dead beats. All sorts of slick means are attempted on garage and repair shops, and some are so well conducted that the proprietor dislikes to turn them down or to offend the perpetrators.

On the other hand there are men and women who are perfectly trustworthy. They may want a month or three months to make a settlement but they will make it. Hence the need of knowing people.

In some towns there is a local credit agency for the benefit of the doctor, the grocer, the hardware merchant, the dry goods merchant, and the butcher. Each of these men pay a small amount each month to someone who keeps a record of the standing of the townspeople on the basis of their promptness in making payments.

There is a list kept of those who pay promptly and a list of those who pay slowly and a list of the dead beats. All of the tradesmen and the professional men of the town who contribute towards the expense of maintaining this useful reference book have access to its records and by it can determine who it is safe to trust and who it is not. It so happened that a plan of this kind was in existence in the office of one of the local merchants of the

town where it was kept up to date by one of the clerks. Jones applied for membership and was accepted.

Thus far in his work of redeeming the apparently bankrupt Clark garage and repair shop, Jones had succeeded in clearing out much of the junk of the place, also in greatly increasing the farming trade, and had obtained several thousands of dollars by his plan of offering a reduction on bad accounts, and he now made up his mind to cater to the women's patronage by offering special inducements.

STRIVING FOR THE FASHIONABLE TRADE

The trade of the four hundred in any community in any line of business is both advantageous and disadvantageous. Jones, however, considered only the advantages of attracting the fashionable people and decided that he would make special effort in this direction. He gave little heed to the arguments of the more conservative Mr. Clark, that the business of the few rich could not be obtained and held without losing some of that of the masses. That it would not be possible to build up a lucrative garage and repair shop custom on the patronage of the wealthy owners of cars alone. That he had already tried out the experiment with resulting losses. That although the rich might be better able to pay high prices for service, that it had been his experience that many of the members of the higher social circle of the town were frequently slow in paying and apt to indulge in considerable dickering over items and costs before paying. That although it might help to advertise the business to have reputable fashionable people about the place with their \$4,000 or more cars, this fact would not help very much toward bringing in the custom of the jitney class. However, Clark finally agreed that it would be the proper thing to get the trade of the four hundred along with the other and finally consented to Jones trying for it.

Jones realized that to procure and hold the best trade of the town involved carrying the best grade of automobile supplies, and providing the best of service in the garage and repair shop. He also realized that these important conditions were quite lacking. But this fact did not retard him from installing what he was pleased to call a woman's section in the sales department for a beginning. He had discovered that a fair average of the automobiles in the locality were operated by women and he considered that it would be less embarrassing for the women if they did not have to pass through a lot of tires, wheels and parts of machines in order to make a purchase of an accessory.

There were usually two or three men in the main store smoking and often talking loudly in an argument over the merits of certain cars or devices, and at times the language was of a character liable to shock the refined. Repairmen in greasy overalls, drummers exhibiting their wares, truck drivers buying lubricating oils, and all kinds of busy men on one mission or the other would be

(Continued on page 38)

Automobile Storage Batteries

Importance of Pure Acids The Sizes of Battery Plates

BY SIDNEY F. WALKER

ANOTHER matter that has given rise to considerable trouble in the past is the presence of foreign substances, salts of iron in particular in the sulphuric acid. There are two or three ways of preparing the acid; the best, the writer understands, is by direct action upon sulphur, but there are methods in which iron pyrites are used; the sulphuric acid obtained from these methods is quite good enough for certain purposes, but it will not do for lead storage batteries, the presence of the iron tends to set up the chemical action mentioned above.

Lead storage battery plates, whatever their form, are usually made in two or three standard sizes, and then a cell for a given capacity is made up from any particular size by placing three, five, seven, or more plates together in the manner described. With each form of plate there is a standard rate of charge and discharge; there is a standard rate per sq. in. of plate surface, and so it is a simple matter to provide for a given discharge by arranging a number of plates of the most convenient size, that will give the total discharge rate, due to the number of square inches.

The working of storage batteries varies considerably in the way the charge and discharge may be arranged. A battery for instance may be listed as having a capacity of say 80 or 100 ampere hours; this means that a current of 8 or 10 amperes can be taken from the battery for 10 hours. Larger currents can be taken from it for a shorter number of hours, but the larger the current, the smaller will be the product of current and time. Thus an 80 ampere hour battery would probably supply a current of 20 amperes for $3\frac{1}{2}$ hours, or with some forms for only 3 hours. With some batteries, the latest modern form, the whole working current may be taken out in one hour, but in that case the capacity would be reduced by at least 50%; 40 amperes might possibly be taken from the 80 ampere hour cells for one hour.

It will be understood that the larger the current flowing, the more powerful is the chemical action that is going on, and as oxidation means increase of volume, unless the battery is specially arranged to allow of a quick increase, trouble will result. Similarly the rate of charging may be varied where it is necessary, or convenient. All electro chemical actions of this kind are performed best with a weak current flowing for a long time. There is always a minimum below which it is not wise to reduce the current strength, but up to that minimum, the battery is better, and has a longer useful life, the longer the period taken for charging. Thus again taking the 80 ampere hour battery, probably the best charging rate would be for 10 hours, or possibly

more. But it could be reduced to 5 hours or less, and some batteries even can be charged in 1 hour. The danger of a rapid charge is the same as a rapid discharge, larger currents have to be employed, the chemical action in the cell proceeds at a more rapid rate, and there is a greater rate of expansion of the active material that is oxidizing. With larger currents also there is greater heat liberated in the electrolyte. It will be remembered that whenever an electric current flows through any conductor, and for this purpose the electrolyte is a conductor, heat is liberated in proportion to the square of the strength of the current, and to the resistance of the electrolyte. The result of a powerful charging or discharging current is to raise the temperature of the electrolyte beyond the safe figure.

THE RESISTANCE OF A STORAGE BATTERY CELL

The electrical resistance of storage battery cells is very much less than that of the great majority of primary battery cells that is one reason why they are able to furnish comparatively powerful currents from batteries occupying a comparatively small space. The resistance of a storage cell of a given size is only a small fraction of the resistance of a primary battery cell of the same size; this means that the storage cell is able to furnish a very much larger current, and to keep on furnishing it than the primary battery cell. In the primary cell, the depth of liquid, the distance between the zinc plate and the carbon plate is several times that between the positive and negative plates in a storage battery cell; also in a primary battery cell the porous pot, or diaphragm that is employed to contain what is called the depolariser, offers a considerable resistance, and so does the loose mass of carbon and oxide of manganese, compared with the arrangement in a storage battery. The resistance of the liquid in a storage battery is also very much less than in a primary battery. In the storage battery as explained, the positive and negative plates are only separated by a small fraction of an inch, and this is filled with the best liquid conductor known. It is the arrangement of the plates so close together, and with the good conducting liquid between them, also the size of the plates that gives the low resistance to the storage battery. Resistance uses up pressure; thus in the Le Clanche cell, the pressure between the terminals, the zinc and carbon plates, when no current is passing through the cell is 1.5 volts; immediately a current commences to flow, the resistance of the cell takes toll of the pressure, and the actual working pressure is usually not more than 1 volt. It will be

remembered that where dry cells have been employed for electrical ignition for motor cars, 4 cells are required where only 2 storage cells are wanted. The storage cells have a pressure of 2 volts per cell, and as the resistance of the cells themselves is very low, there is very little reduction of pressure when the current is flowing from them to the induction coil. With dry cells, on the other hand, the resistance of the cells being so high, the current required by the induction coil takes toll of $\frac{1}{2}$ volt per cell or nearby.

It should be mentioned here that the small dry cells that have been on the market for some little time now for flash lamps, have as low a resistance as storage battery cells of the same size; the writer has in his possession small storage cells, and small dry cells, of exactly the same size, both furnishing current for a flash lamp, and apparently doing it equally well; the only difference is that the dry cell has to be thrown away after giving a certain number of flashes, the storage cell can be recharged again and again.

CHARGING THE LEAD CELLS

As explained in a previous part of the article, a current of a higher pressure has to be employed when charging secondary battery cells of all kinds, than the pressure the cells will deliver when discharging. The standard pressure of the lead cell on commencement of discharge is 2 volts; immediately after charge it will furnish 2.2 volts, and sometimes more, but the pressure very quickly falls to the standard figure. The reason the charging current has to have a higher pressure is because the electrochemical actions that are going on inside the cells during charge set up a back pressure of from 2.2 volts upwards. For a large portion of the charging period the pressure required is 2.2 volts; towards the end of the charge the back pressure rises to 2.5 volts, and if the charging is continued, it will rise to 2.75. It is at 2.5 volts that gassing commences, and it is always wise to disconnect the battery immediately the back pressure commences to rise. Fig. 12 is a charging curve for a lead storage battery, as will be seen, when the battery is connected to the charging dynamo, the pressure rises almost at once to 2.2 volts per cell, and it continues at that figure for the larger portion of the charging period, and then suddenly rises to 2.5 and 2.75.

There are one or two important matters in connection with the higher pressure at the end of the charge; unless proper arrangements are made, when the pressure rises, the battery may discharge through the dynamo, and as the resistance of the dynamo is very low, the whole of the charge that has taken some hours to be put into the battery, may come out in a few minutes. This is usually provided for in the charging dynamo itself; where the battery is charged from a dynamo carried on the car, and driven by the engine, the dynamo is constructed so that if the pressure of the battery rises, so will that of the dynamo. Another point is, never take a naked light near a gassing storage battery; an incandescent electric lamp is of course quite safe, but care should be taken

that there is no chance of a spark passing in any part of the connection to the lamp. The reason is the gases that come away from the battery are composed of hydrogen and oxygen, and if a naked light is present where there is a mixture of the gases, or if an electric spark passes through them, the hydrogen combines with the oxygen rather violently, something like an explosion taking place.

Another reason for not allowing gassing to continue is, the bad effect it has upon the active material, tending to loosen it, and also as the gases are taken from the electrolyte, the liquid in the cells falls, and they require filling up more frequently. For storage batteries carried on motor cars, the best results are obtained when the battery is "floating" as it is termed on the dynamo; when a more or less continuous pressure of 2.2 volts per cell, and a little over is being furnished by the dynamo; the battery seems to give and take very conveniently, and very comfortably under those conditions.

A point that should be mentioned here is, the resistance of the cells of the storage battery require that a slight additional pressure shall be provided in the charging current to overcome it. Resistance always uses up pressure so to speak, in proportion to the current flowing and the resistance of the cell. If a cell has a resistance of say 100th. of an ohm, and a current of 10 amperes is flowing through it, either during charge or discharge, the resistance absorbs $1/10$ th. volt. With a large battery, such as would be used for lighting a building, the addition to the charging pressure is moderately serious, but with the small batteries used on motor cars it only amounts to a fraction of a volt, but it must be provided.

The writer believes it is now well understood that on motor cars, and generally when charging storage batteries, an automatic cutout should be provided between the battery and the source of current, in case the pressure of the charging current falls below that of the battery. With motor cars, dynamos driven by the engine necessarily furnish a lower pressure than that required for charging the battery when the engine is running below a certain speed, and the automatic cutout and cutin attends to this. With modern motor cars, with powerful engines, designed to run on top gear, and to vary the speed according to the road, and to the gradient, this may be more important than where the engine runs at one speed, and the speed of the car is varied by the change speed gear wheels. It has been arranged by one of the pioneer British firms, not to bother with an automatic cutout; if the pressure furnished by the dynamo falls below that of the battery at the moment, the dynamo is allowed to run as a motor. As it has no load beyond its own friction, and the current required for its own magnetism, the discharge current taken from the battery is not serious, and the makers rely upon the driver switching the connection between the dynamo and the battery off, as soon as he hears the dynamo motoring. There is a good deal to be said for this. The automatic cutin and cutout may give trouble; it has a double office; when the engine starts up, the battery is not connected to the dynamo, and it is only when the pressure at the terminals of the dynamo reaches a certain

figure that the electro magnet operating the cutout, and cutin works. The electro magnet has two wires, one a very long one, consisting of a very large number of turns of very fine wire, that responds to pressure, and the other a few turns of very thick wire that responds to current. The two coils correspond to those actuating a volt meter and an ampere meter; when the pressure for which the apparatus is set is reached, the armature of the electro magnet is pulled up to its core, and the lever which carries the armature also acts as the moving contact arm of a switch as the armature moves up the lever closes the switch. Immediately this is done, current flows through the thick wire coil of the electro magnet on its way to the battery, and this current, the magnetism it induces in the iron core of the electro magnets, assists to keep the switch closed; this is the cutin part of the work. When the pressure of the dynamo falls below that for which the armature is set, two things happen, the pull upon the armature due to the thin wire coil, the pressure coil is reduced; and at the same time, the current flowing through the thick wire coil is reversed, as it is now flowing from the battery to the dynamo; the combined effects of the reversed current in the thick wire coil, the lessened current in the thin wire coil, and the spring that opposes the pull of the electro magnet upon the armature, breaks the circuit, or should do very quickly. The danger with this apparatus is one that is common to all automatic appliances; there is always the possibility of the armature sticking, either when the switch is open, or when it is closed; there is the danger of the spring losing its tension. Of course this again is a matter of care; if the dynamo and the battery are well looked after, the automatic switch ought not to be neglected, and probably would not.

POINTS TO REMEMBER IN CHARGING THE BATTERY

The principal point to remember when charging a battery from the dynamo carried on the motor is the pressure; the volt meter on the little switch board carried on the dash should show the pressure of the battery at any moment; if the pressure of the battery falls to 2.2 per cell, or thereabouts, if the dynamo has been disconnected, it should immediately be switched on to the battery. On the other hand when the volt meter shows a pressure of a little over 2.5 per cell, say 2.55, the dynamo should be switched off the battery. It is not much trouble to keep an eye on the volt meter, and to open or close the switch connecting the dynamo to the battery as required. The danger of running the charging current into the battery after it has commenced to gas, after the pressure of 2.55 per cell has been reached, has been explained above; there is also another danger, the battery works best when floating, but there is a tendency for the active material on the positive plate to loosen with very continuous charges, even when the pressure does not rise to the figure named.

The temperature of the battery when in work should be taken from time to time; thermometers are on the market specially designed for testing the temperature of the electrolyte; it should never go above 100 degrees

F; if it does trouble will result later on. A motorist cannot of course be constantly opening up his battery to take the temperature of the electrolyte, but he can do so occasionally after a charging run, say when the battery has not been required to furnish any current for some time. The density, or as it is usually expressed, the specific gravity of the electrolyte should also be tested from time to time; when completely charged the hydrometer reading should not be below 1280 nor above 1300. If the sp. gr. is above 1300 the solution should be slightly weakened by the addition of a little distilled water; if it is below 1280 a little dilute acid should be very carefully added. On discharge as explained, the sp. gr. is considerably less. There are hydrometers on the market, specially designed for use with storage batteries, and they should be employed; their readings and that of the volt meter should enable any well made battery to be kept in good order and to keep up to its work for a considerable time. American makers claim, and the writer believes with justice that their batteries will go on working, lighting and starting for two years or more without requiring the maker's overhaul. Fig. 13 shows a hydrometer arranged with a syringe for testing the sp. gr. of the electrolyte.

CHARGING STORAGE BATTERIES FROM A TOWN OR FACTORY SERVICE

Where a dynamo is not carried on the car; the writer believes it is very general to do so now in America, and is gradually becoming so in the United Kingdom; the battery has to be charged from some other source of current. Only continuous currents can be employed for the purpose; unless rectifiers are used. Alternating currents can be employed if a rectifier is placed in the circuit; the rectifiers that are on the market are practically forms of the mercury vapour arc lamp, specially designed for the purpose; they stop the negative currents and only allow the positive currents to go through. In the writer's opinion, it is doubtful whether the charging is so good with a succession of positive currents every 40th, 50th, or 60th of a second, but successful results have been obtained with them. The reason why continuous currents, or rectified alternating currents only can be employed is, the chemical actions that go on would be undone as fast as they are accomplished if alternating currents were employed. Each ampere of current, and each fraction of an ampere accomplishes a certain definite amount of chemical action; when it is passing through a storage cell in the direction for charging it raises a definite portion of one oxide to a higher oxide, and a definite portion of the other oxide to spongy lead; when it is flowing in the direction for discharge definite quantities of lead are oxidised and of high oxide reduced to a lower oxide. This can apparently be accomplished by a succession of positive currents, but not by a succession of reversed currents.

One of the difficulties in connection with charging automobile batteries from town or other services is, that the pressure of the service is always much greater than that of the battery. Town service pressures are not usually

in the neighborhood of 100 or 200 volts; there are some country house plants in use in which the pressure is in the neighborhood of 30 volts, but even these pressures are too high for the automobile batteries. The 3 cell battery requires a pressure, at the outside of 8 volts, and the 6 cell battery of 16 volts. Where alternating currents are used with a rectifier, a stationary transformer can be employed to lower the pressure to the figure required before the current enters the rectifier. With town service the method may be adopted of putting in a small motor generator; these apparatus are built to convert comparatively high pressure continuous currents to the pressures required for the battery, and also to convert alternating currents of any pressure to continuous currents of battery pressure. It is not usually worth the expense, unless a car owner has a number of cars, and therefore a number of batteries; in that case also, he could connect the batteries in series if there were enough of them, so as to use up the pressure. In the majority of cases, however, a resistance has to be inserted in the circuit between the service and the battery. The resistance can be a length of the special resistance wire that is on the market; it can be made with a multiple switch so that the pressure required by the battery can be increased at the end of the charge as shown in Fig. 14. The usual plan is, however, to connect incandescent electric lamps in the circuit between the supply service and the battery. With the small flash light storage batteries, a single incandescent electric lamp of 16 candle power is usually sufficient; the lamp acts as an indicator to show when the current is flowing, and it will also show the end of the charging period, by an increase in the brightness of the filament. For motor car batteries larger currents are required, and therefore a number of incandescent lamps have to be connected in parallel as shown in Fig. 15; the number and the candle power of the lamps will depend upon the size of the battery. Each lamp requires a certain current to furnish its proper light; it furnishes a little less light when connected in series, or series parallel with a battery; but the number of lamps required is easily found by taking the current required for each lamp and dividing it into the number of amperes required by the battery.

Suppose for instance a battery requires a charging current of 10 amperes, and the lamps that are to be used for resistance require a current of $\frac{1}{2}$ ampere, 20 lamps must be connected in parallel. If the arrangement is to be permanent, the simplest plan is to fix up a number of lamps in their holders on a board, something on the lines in which lamps are arranged for illuminating purposes at fetes, with a double pole connecting switch at one or both ends. If any of the lamps burn out, it will not be a serious matter if say one or two are not replaced, but if there are more than two they should be replaced immediately. The charging process is exactly the same as with the dynamo run by the motor car engine; the charging current should have a pressure of 2.2 volts per cell for the greater part of the charging period and then be increased, but it will be increased automatically by the action of the battery itself where incandescent lamps are used.

Do You Contribute ?

COLLECTIONS in these days aren't confined to rare vases, postage stamps, curious coins and newspaper clippings. One of the representatives of the Willard Storage Battery Company is authority for the fact that two young fellows in adjacent farms not far from Cleveland have worked up a lively competition in the collection of automobile jacks, tire chains and other miscellaneous bits of automobile hardware.

How do they build up their collections?

That's easy when you know the facts.

The two farms are in a valley. A long steep hill rises between the valley and the village. Another hill just as long and just as steep ascends on the opposite side.

Up one and down the other there's a particularly busy stream of Sunday automobilists from about the time the first church bells ring, until the urge of hunger or weariness takes everybody home again. It's easy for the big high powered car to take the slope—and the boys aren't interested in them at all.

But the drivers of the little fellows with the gas tanks in the rear have what seems to be a mania for forgetting to fill their gas tanks to a point where the gas gets to the carburetor in sufficient quantity to take the hill. Then, about half or two-thirds of the way up the grade, there's a sputter and a cough and the little bus stops dead.

Then the law of human averages get in its work. The driver looks around for a rock to put under the rear wheel so that his wife and six kids will be kept from racing backwards down the hill while he's looking for more gas or a kind brother with a tow rope. There aren't any rocks. So he looks under the rear seat and hauls out the first thing he grabs: sometimes a tire chain, sometimes a jack, and occasionally, but not often some other piece of automobile hardware.

Of course, there are some drivers who remember to pick up the "block" and put it under the seat again, but there are not enough of these to spoil the collecting game.

As the "down" drivers are too busy watching the road and too concerned about being bumped by the car behind to stop, and as the "up" drivers hate to lose their headway for anything so trifling as a jack, tire chain, or wrench, all the loot is left for the ambitious young collectors, who are accumulating a supply of accessories against the time when they themselves will be operating their own cars.

CLEAR AS MUD

Englishman—"What do you mean by giving a man the air'?"

American—"Tying a can to him, putting the skids under him, giving him the gate or checking him out. Understand?"

Englishman—"Oh, perfectly. But what do all those things mean?"

—Rochester Retailer.

The Forum

This department is for the readers of our magazine. Here you can express your views and opinions on subjects relating to automobile construction, maintenance and repair, driving, etc., and here you can discuss various subjects with other readers.

Letters must be addressed to The Forum, and must be signed with your full name and address, which is not necessarily for publication.

All letters to the Forum will be welcome, but it must be remembered that the Editor assumes no responsibility for the views of readers appearing in these columns.

We print below another letter on the subject of Wood vs. Metal Wheels—also some readers' comment on the subject of colors for Tail Lights. What is the sentiment in your town regarding a change in the color of Tail Lights?

ALL-METAL VEHICLE WHEELS

Mr. Editor—I want to write a few words of hearty approval of "The Forum," which is one of the best departments presented in trade journals and is also just what readers make of it. They can, if they will, put "The Forum" far ahead of any other portion of this Journal. All that is necessary to do this, is for each one to help and to write and send bits of personal experience.

I want to "do my bit" by giving the metal wheel another roll toward recognition, for it surely will be found the best vehicle wheel possible when properly designed and made. But, like many other things, the metal wheel must be developed, prejudice eliminated, and both manufacturers and users educated to the characteristics of metal wheels.

Perhaps a bit of early experience with metal wheels may be found interesting. Away back in 1870, the writer helped his father make patterns for, and fit up wooden wheels with cast iron hubs, for a one-horse wagon to be used on the farm, for hauling lumber, hay, and about everything else.

The hubs were made in two pieces, with no machine work whatever about them, save to grind smooth the ends of the hubs where axle-collar and nut were to bear. As shown by Fig. 1, the longer piece A, fitted the axle, being cast upon a "chill" which was a piece of steel turned to a taper, same shape as the axle and enough larger that there was room in the hub for the axle and the necessary amount of grease.

METAL HUB

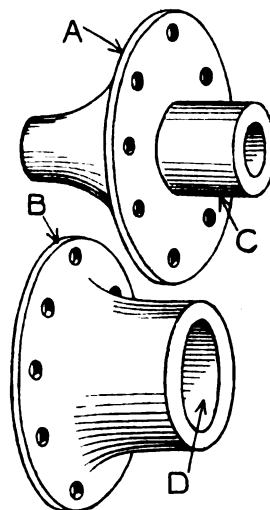
What a time we had in getting the chills of the right size! and then, when the mold had been poured around the steel "chill," what a task it proved to get the chill out of the hub! If not driven out very soon after the hub had been poured, the chill never would come out until the hub had been drilled and split off with wedges. But after a while, it was found that a smart blow from a ham-

mer upon the small end of the chill, would start it out if done as soon as the cast iron had solidified, and while it was still at a dull red heat.

Piece B shows the loose part of the metal hub. It was cored out large enough to slip snugly over piece A, and then $\frac{3}{8}$ -inch bolts were put through both hub-flanges and the spokes which were clamped between the flanges. In the first hubs, there was a bit too much room between pieces A and B, so my father, after the wheel was bolted, set the hub on end and filled all cavities between pieces A and B, with melted babbitt metal.

The bolts were arranged to fit holes bored through the joints between each adjacent pair of spokes. Thus there was one joint without a bolt and a bolt through the next joint, etc., so that each spoke was cut away a half bolt hole only. The spokes were fitted well to each other and to the flanges and the surface C, which went through hole D.

In case the spokes ever got loose in the hub, from exceedingly dry weather, or long wear of the wheel, they were quickly tightened when the tire was removed for setting, by driving between one or more pairs of spokes, some pieces of thin sheet iron. This did the business per-



fectly. The writer saw those hubs in use for nearly thirty years, and beyond doubt, they are running on a Massachusetts farm today.

About the same time the iron hubs were made, a metal wheel for a very light barrow was built as shown by Fig. 2. The wheel-barrow was for use in carrying millwright's tools back and forth to a mill a quarter mile away, where work was done, keeping the machinery in order.

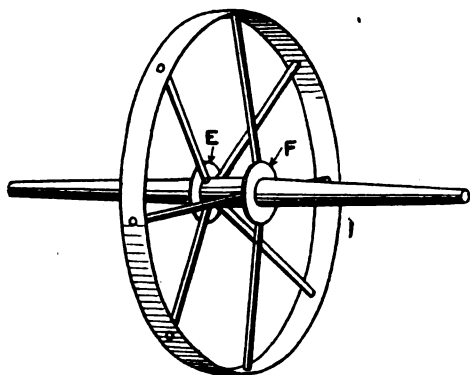
The tire of the wheel was made of a piece of "half-round" door track, bent up and welded, round side innermost. The spokes were $\frac{3}{8}$ -inch black iron (this was before the days of mild steel) and the axle was a piece of $\frac{7}{8}$ -inch black iron, "drawn down" to a half-inch at either end. Two cut washers were "shrunk on" where the staggered spokes came against the axle, and then the spokes, washers and shaft were brazed together. The rim was drilled, the spokes driven in tightly and brazed.

This wheel gave good service for many years, but when

overloaded, the brazing would tear away from the washers. The reason—brass is not as strong as iron or steel.

BARROW, METAL WHEEL

A small wheel made up as shown by Fig. 2, and welded by electricity or by the oxy-acetylene process would stand up to any load not great enough to flatten the rim between spokes and by increasing the number thereof, the point of failure could be transferred to bending of the shaft. It



is thus quite clearly shown how important it is to design an all-metal wheel for vehicles, with all the skill that knowledge and experience can give to the man who is making such wheels. But, "Built Right and Run Right" there is nothing better than metal wheels:

JAMES F. HOBART,
Dunedin, Florida.

TAIL LIGHTS

Mr. Editor:—I noticed your editorial in the January issue, "Shall Tail Light Color for Auto be Changed," and as you request the opinions of your readers, I take the liberty of a few suggestions on this subject.

As a rule all danger signals are usually stationary, and consist of a red light, making it hard at times, when driving at night, to know whether the red light one sees ahead is a car, either parked or moving slowly or whether it is an obstruction in the road guarded by a red light of some kind.

In order not to confuse the motorist, I would suggest that all tail lights on autos should be light green, similar in shade to those used on block signal lights on many railroads.

The green light is used very seldom, except for the above purpose, and when one saw a small green light ahead, one would know that it was attached to an auto, and not for the purpose of marking an obstruction or as a danger signal of any kind.

Should the autoist desire to equip his car with a "Stop" light, then this light should show red, in order to denote the fact that the driver is slowing down or stopping, either event requiring caution from a driver fol-

lowing, and liable to be a source of danger if warning is not given.

At the present time I cannot recall that green is used for any purpose other than railroad signals, and I can see no reason for this color to be taken for any other purpose than denoting the presence of an auto. It is a color that can be seen and distinguished equally as far as red can, and to my idea, would be less confusing to the auto driving public than a red light.

Very truly yours,

W. P. DOWNS.

AUTOMOBILE TAIL LIGHTS

Mr. Editor:—Regarding tail lights and their color as discussed in an editorial on page 34 of the January issue: it is the opinion of the writer that the matter of tail lights needs the attention with power to act, of a strong committee from the American Automobile Association. While front-end car lights have been improved, and many cars now carry five separate lamps, two large and two small ones, and a useful "spot" lamp, which is the handiest thing ever placed upon a car.

But the tail light still remains a dinky little "wart," only one step in advance of a kerosene light, and seemingly, without improvement from the time the first automobile was placed in commission! The matter of tail lights needs wider experience and greater knowledge than possessed by the writer, but for a "starter," let there be more lights placed at rear of the car. One is not enough. It may, and does frequently go out, and first thing the driver knows, he is "pinched" for driving his car without a tail light.

The writer believes there should be a red tail-light attached to the rear of every car, and said light should be working at all times after dark while the car is on public streets, no matter whether the car is in motion or at rest. Even while parked, this light should be visible, unless a separate parking light be in operation.

In addition to the red rear-light, there should be in operation on each and every car, a green or blue tail light which is in operation only while the car is in motion, and with the red tail light, show at all times when the car is moving, either forward or backward. The writer very strongly urges that a modification of the Beacon Stop-Lite apparatus be developed and adopted by the Society Committee named in a preceding paragraph.

The Beacon Stop-Lite Signal is a tail light which automatically displays in black letters, the word "STOP" against a red background, whenever a car driver disengages his car clutch preparatory to stopping the car. The modified tail light should consist of two lamps, the red burning all the time, and the green or blue light connected by means of two switches, similar to those of the Beacon signal, to the shift gear lever of the automobile, in such a manner that the blue or green light will be started whenever the gear lever is moved forward or backward. The light will be extinguished only while the lever is in "Neutral." Then, there will be two rear lights, instead of but one as now-a-days.

JAMES F. HOBART, Dunedin, Fla.

The Turning Lathe in the Repair Shop

The Man Who Knows How to Use His Machine
Can Turn Out a Surprising Number of
Different Jobs—Some Pointers
on Thread Cutting

BY F. J. SPANGE

THERE are a few forms of screw threads with which the repair man ought to be familiar. Some are used for the generality of screws and some are for particular things.

First, there is the sharp V Thread. When certain changes are made in its design, we have what is called the United States Standard Thread. These are the principal threads in general use in this country.

However, the Briggs Thread is used for pipe connections. This is a kind of V thread, but it is cut so that there is a slight taper. The object of the taper is to provide a simple means of screwing a pipe end into a connection or into another pipe end and getting a *tight fit*. It doesn't matter if the threads do wear, one taper is screwed into the other until a tight fit is secured. This is the American system of connecting up pipes and tubes by means of screw threads. The English use a different method, and so presumably do the French and Italians.

There is a special thread used with worn gearing. This may be useful to the automobile repairman.

Automobiles made in England may be expected, some of them at least, to use the Whitworth Thread or the British Association Standard Thread.

Then there is the French Thread (International Standard Thread). This is the same or nearly the same as the U. S. Standard Thread.

These include, I would think, pretty much all the varieties of threads to be expected in the generality of automobile work.

The reader is to remember what was told in the preceding article in respect to the form of thread. What is meant when a drawing is given or dimension stated is generally the form and size that appear when a section is made through the axis of the screw.

The drawing that represents this section will show the shape and size of the cutting edge of the lathe tool. It is necessary to understand this matter to some extent in order to know how to make the thread cutting tool.

It will not be necessary that the drawing show the whole section, clear across. What is wanted is the shape and size of the thread and groove. However, the reader is to bear in mind that the portion of the section shown is part of a section that *goes through the axis*.

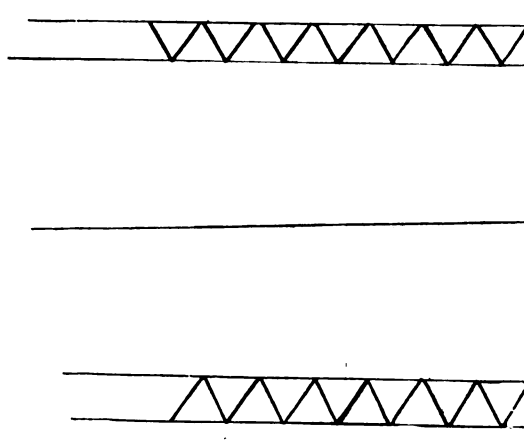
I.

THE SHARP V THREAD

Generally this thread has a section that is nothing more and nothing less than a triangle whose three sides are all equal. Each of the angles will be 60 degrees—that is, two-thirds of a right angle. The groove is another triangle of the same size and shape. Examine the drawing showing this thread, and see for yourself how simple it is.

When a cutting tool is made for the lathe, we simply make it fit the groove. In fact, in making the tool, we need pay but little attention to the depth of the thread. We make the tool big enough. It can't very well be too big. We have to be careful to get the angle just right so that the groove will have the proper angle. When the angle is right, the cutting edge can be as big as you please. It doesn't matter in so far as getting the thread right when we cut it on the lathe.

This really is quite important, because it means less at-



tention in making the tool and especially because *one tool* can be used for deep and shallow threads. The tool cutting edge should be big enough, but it can't be too big.

The reader will now understand, perhaps, that the simple V Thread is an easy proposition. A few remarks will, however, be in order. The top of the thread will likely be quite sharp when we actually cut the metal. This sharp edge is not very desirable, as the one thread may cut into the other when a screw is turned in a nut.

(Continued on page 40)

Automobile Dealer and Repairer

A Mechanical Motor Magazine

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M. T. RICHARDSON President and Treasurer F. R. WHITTEN Secretary
M. T. RICHARDSON, Editor
GEORGE H. WILSON, Managing Editor

F. R. WHITTEN, Advertising Manager
H. F. LUDINGTON Western Representative GEORGE A. SMITH Eastern Representative
FRANKLIN MYERS Art and Copy Manager

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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

All communications should be addressed to the New York City office at 16 Hudson St.

"The Human Element in Service"

"We read a great deal about service from various stand-points. There is good service, poor service, quick service, slow service, free service, costly service, hourly rate service, flat-rate service, and many other kinds of service. One firm claims their success is because their foreman works on the job the same as any other man. The next firm credit their success to the fact that the foreman does not work on the job. To my mind the service man is the one on which the success or failure of any kind of service work depends.

"Let us take for example the following incident. A friend of mine drove up to a service station to have grease put in the rear axle. It makes little difference whether this job was done by the foreman or the office boy, whether it was hourly service or flat-rate service, the results and cost should have been somewhere nearly the same. As it turned out the cost was satisfactory but the results were not. In two days the rear wheels began throwing grease like a side-wheeler throws water. We removed the filling plug, drained out two quarts of grease, took out the axle shafts, swabbed out the tubes, washed out the brakes, put in new felts and the job was O. K.

"Now as near as I can figure it out the trouble was one of the following three:

"The service man may have been dishonest and wanted to sell more grease than was necessary; he may not have known the results of too much grease, or else

he was not paid to have an interest in his work and do it well.

"The trade wants satisfactory service and in order that we secure such service we must have service men who are honest, who *know the job thoroughly and are paid on a basis of their knowledge, ability and willingness to turn out a satisfactory piece of work.*" G. M. Hewitt, Bradley Polytechnic Institute, Peoria, Ill.

The italics in the above letter are ours. We believe Mr Hewitt has laid his finger on a chief cause for unsatisfactory service in many service stations, garages and repair shops. It necessarily follows, of course, that where such unsatisfactory service is rendered, there may we expect poor business methods and a lack of the prosperity that is the reward of careful, competent, earnest effort to serve. We have had considerable to say about proper equipment for the garage and repair shop, but shop owners recognize today, more than ever, that no matter how good their equipment, the wrong kind of service will convert such assets into liabilities. Install proper equipment but be sure the right sort of men are operating it.

Contest Closing Date Advanced

Quite a considerable number of our readers have requested that our Motor Mechanics Contest be continued for an additional period before closing, in order that a larger number may have time in which to prepare entries. We have therefore extended the Contest Closing Date and the contest will remain open until March 31st. Beginning on April 1st we will open another similar contest which will also run for three months. We hope that with the extra time given contestants there will be many more entrants.

Capacity of Shop Machine Tools and Equipment

We have just received a folder from the manufacturer of electric drills. It has brought to our attention a very remarkable fact, namely, that there are some six hundred and sixty-odd different uses for an electric drill in almost any automobile repair shop. Perhaps you knew this to be the case. The uses mentioned are named by garage and repair shop owners located all over the country. Probably there are still more uses. The point we wish to make, however, is that the real wide-awake repair shop owner should give careful attention to the "usability" of the tools carried in his shop. It is just another angle of the shop equipment problem. If there are so many uses for just one tool named, it behooves repairmen to look after the equipment generally, and to see to it that the general shop tools are utilized to capacity by the various workmen. Good tools and machines, properly used, facilitate all varieties of repair shop work and reduce the time required to turn out numerous jobs.

Work Shop Experience Prize Contest

Contest Closes March 31st.—Send in Your Articles Now

FROM A PRIZE WINNER

February 2nd, 1923.

Dear Mr. Editor:

I was agreeably surprised on arriving home last evening, to find your letter and check announcing that I had been awarded First Prize in the Work-shop Experience Contest. I have been a reader of the Automobile Dealer and Repairer for over three years, and I take this opportunity of stating that it has been a great help to me in my work. We auto mechanics, as a rule, have a tendency of falling into a rut, the result of working hard all day with our hands, and it is only by reading an up-to-date trade magazine such as yours, that we can keep our minds free and braced up, so that we can expand and grow above the daily grind. It is for this reason, that I regularly subscribed to your magazine and I believe it should be read by every thinking auto mechanic. Thanking you for your promptness and courtesy,

I am, very truly yours,
HUGH O'NEILL.

ROADSIDE REPAIR FOR REAR HUB

ANY one who has ever had a rear hub give way on some lonely country road when everything seemed to be rolling along nicely knows well enough that the sensation is not very thrilling. But the case may not be as bad as it looks at first if one happens to have a piece of rope a few feet in length.

If the hub is not broken so the wheel will slip off and the car does not happen to be one of those makes which has very little hub extending out past the wheel, a very good repair can be made with a piece of rope in a very short time.

Tie one end of the rope to spoke and wrap around the hub toward the front of the car (to the right if the right wheel and to the left if the left wheel) as tight as possible. Make as many wraps around the hub as can be made so they will stay on and then tie the other end of the rope to spoke in wheel. Pouring water on the rope after it is properly tied will make it grip the hub much tighter, thus insuring a surer job.

With just such a repair the writer once drove a distance of eleven miles and at the end of that distance the job looked good for several miles more.

W. B. HILER, Tex.

PLUG TESTING KINK

MANY of us have had our troubles with spark plugs not acting at all times, in just the manner we would have liked best, even before the advent of the auto-

mobile. In those good old days we succeeded in guiding their action fairly well by means of reins, but now days spark plugs have received some form of gland treatment which gives them a kick that is hard to control. The action of any sort of electrical equipment is comparable to the actions of the majority in that it follows the path of least resistance. To find a remedy or to eliminate the weakness is our daily problem. One of these problems is as follows:

The pressure per square inch in a motor cylinder varies greatly with the temperature and load. These variations are often the cause of much annoyance to the operator and often to the trouble shooter. It takes a greater amount of electrical pressure to force a spark across the points of a plug when it is in the cylinder under pressure, than it does across the same points when lying on the cylinder head under atmospheric pressure only. To prove it try this simple experiment; hold your screw driver on the plug terminal as in testing for a shorted plug, let the other end be the width of the gap allowed for the plug points, or $1/32$ " away from the cylinder block. You now have two possible circuits for the current to pass over. Notice that it takes the one on the outside. Gradually widen the space between the end of the screw driver and the cylinder block to the point where the spark disappears. Notice the width of this gap. This gives an idea of the relative pressures. It also proves that you cannot rely on a plug simply because it tests O. K. on the outside of the block.

A simple piece of apparatus that is handy to use either with a spark plug testing device, or with plugs on the top of a cylinder block, is to cut the top out of an ordinary fuse plug as used in an electric lighting circuit. Slip this thin disc of mica between the points and test; the plug or the wiring to that plug if it is in good working order should force a spark at least $1/4$ " around the edges of the disc. If there is a short from any cause it will show up, either by sight or sound, somewhere in the circuit.

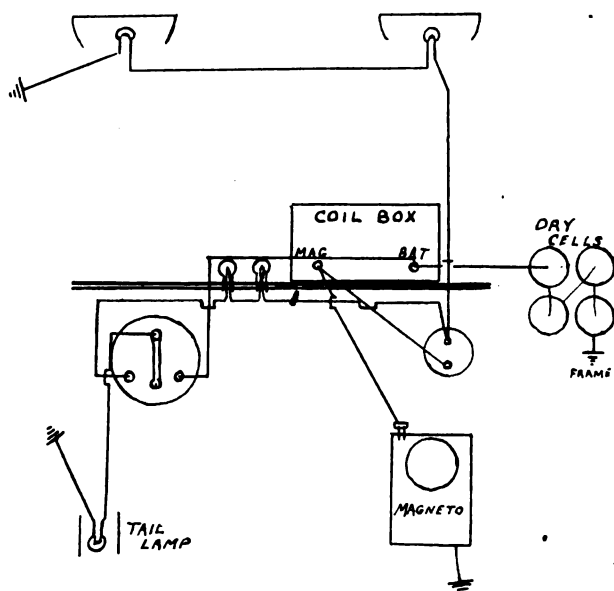
A. C. HARGRAVE, Cal.

TAIL LIGHT FOR FORD TRUCKS

We are using, as are thousands of others, a Ford ton truck, without storage battery and starter. With the fast running motor the head lights give a splendid light, but to keep the tail lamp burning was our problem. These trucks come equipped with two oil lamps in front and one as a tail lamp, but the vibration, even with pneumatic tires, continually jarred out the tail lamp and more especially when the truck was not loaded. We also felt the need of a dash light, while driving, and if one was put on (off the magneto) an 18 volt 2 c. p. bulb had to be used and these are expensive and almost impossible

to obtain. I am enclosing a simple diagram showing how we figured out a real dependable tail lamp and dash lamp as well. Either buy an ordinary electric tail lamp or the oil lamp when bottom and top are removed and pieces of metal soldered over the holes and a socket to hold the bulb soldered in will answer as well.

Secure a pair of double contact sockets to hold dash light bulbs and place these side by side through the left side of dash, where dash light is desired. There should be a piece of tin placed above these to keep the light down and out of the eyes. Also secure a cheap double throw



switch, and run a wire from headlight switch, from same terminal as the wire that goes to headlights, to first dash light bulb and from there to the second bulb and from there to left side of double throw switch. The center terminal of this switch joins with the tail lamp which is double contact and a wire is run back and fastened to frame. This places the two dash light bulbs and the tail lamp bulb in series with each other and in parallel with the headlights, when the switch lever is thrown to the left side, and as these bulbs are all standard 6 volt 2 c. p. they will produce a good light and will not burn out.

Should anything happen to the tail light the dash light immediately goes out, so this makes a dependable check on the tail light. I might mention that if higher voltage bulbs are used the finer wire used in them wouldn't stand the vibration in the tail lamp.

Those who use dry cells for starting can have a tail light burning while truck is standing on the street, by running a wire from dry cells to left side of double throw switch and when switch lever is thrown to the right the tail lamp will burn brightly, and not the dash lights, and the tail lamp will consume very little current from the dry cells. For lights in front the oil lamps can be used.

I might mention that if dry cells are not used the double throw switch is not necessary, so just run the wire from the last dash light bulb directly to the tail light. This arrangement is extremely practical and even if the truck

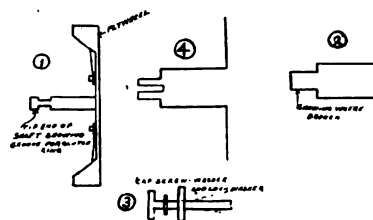
owner takes this article to a garage, the satisfaction of having a real dependable tail lamp is well worth the expense.

ARTHUR SCOTT, Canada.

(Illustrated)

CLEVER CLUTCH REPAIR

As you note from the drawing the tip end of the shaft was broken off where the ring goes to hold the ball-bearing thrust used in disengaging clutch. The repair was made by drilling hole in end of crankshaft and tapping for



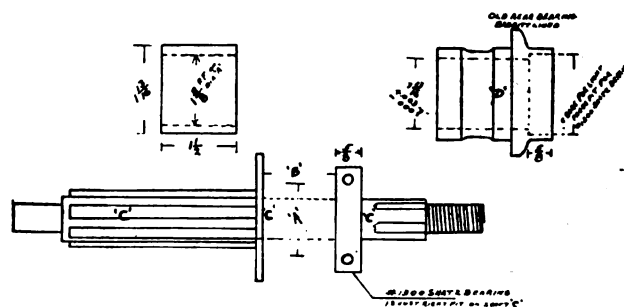
$\frac{3}{8}$ S. A. E. cap screw. Then I put on a large washer and lock washer and tightened to place. The pressure of the clutch has tendency to keep it tight, as the crankshaft revolves from it. This might be helpful to some mechanic should he have a similar repair to make.

J. S. DAVIDSON, Mont.

(Illustrated)

CURING PROPELLER SHAFT VIBRATION

I own a 1920 Maxwell touring car and about eighteen months ago the propeller shaft developed an unusual knock and vibration. On inspection I discovered that this was caused by a badly worn rear bearing in the transmission. The Maxwell used a solid babbitt bearing with bronze backing in this model and I did not want to use a solid bearing in this place, so I decided to try and insert a ball-bearing, and with the sketches submitted herewith and as plain language as I can use, I will explain how I did the job.



As per sketch, the spline shaft 'C' or main drive shaft had a hardened and ground bushing 'A' 'B' pressed on shaft 'C'. Its original diameter was $1\frac{3}{4}$ " and the length was $2\frac{1}{2}$ ". This hardened bushing acted as shaft bearing

running in the babbitt bearing. 'D' I ground the diameter of this bearing down to $1\frac{3}{8}$ " and faced it to $1\frac{1}{2}$ " long. I then made bushing 'E' with a press fit over diameter 'A' of the old bushing after it had been turned to $1\frac{3}{8}$ " diameter. I then bored out the old solid bushing 'D' and it cleaned up at $1-13/16$ ", so I turned bushing 'E' to a running fit. After facing the old bushing from $2\frac{1}{8}$ " to $1\frac{1}{2}$ " this left a space of $\frac{5}{8}$ " to be filled with a ball bearing of some kind. I procured a No. 1300 Shatz ball bearing which was $\frac{5}{8}$ " wide, 1.000 hole and $1-15/16$ " O. D. As per sketch, shaft 'C' being already 1.001, this made a nice press fit into the ball bearing. I then counterbored the old solid bearing 'D' as shown in sketch, making it a light press fit on the O. D. of the ball bearing. This gave me a combination bearing of the plain and ball type. I have access to a machine shop and, being a mechanic myself, it was perhaps an easier undertaking than some would think. I have not had one bit of trouble since installing this bearing and there is not the least bit of shake or wear noticeable since the bearing was installed. I hope this may be of help to someone else who has experienced the same trouble.

J. BLOODGOOD, N. J.

MUDDY HOLES NO AUTO KNOWS

To have an automobile get stuck in soft ground is a sorrow which practically every owner of an automobile has experienced. If the road is a secluded one and the car rather heavy and the mud exceptionally soft, getting out the stuck vehicle becomes a problem of the first magnitude. The poor owner, or driver, will resort to jacks, road-building processes and to the gentle art of going to the nearest farmhouse which—if misfortune is excep-



tionally unkind to him—may necessitate a five or ten mile hike. In short, getting stuck with an automobile is a sad, sad story. It is therefore my firm belief that all readers of the AUTOMOBILE DEALER AND REPAIRER will appreciate my easy method of releasing a stuck car.

A plank is put under each car wheel as far as it will go and then it is tied in the manner shown in the sketch. When the wheels start to revolve they will carry the planks under the wheels with them and the car will automatically free itself.

H. ROLLBAND, N. Y.

BELIEVE IN SIGNS

Sign on bakeshop window reads: "Ma's Bakery." Just underneath Ma's proud boast was lettered, "Pop on Ice."

—Rochester Retailer.



Wisdomites

Ignition wire efficiency is not always determined by the thickness of the insulation. Unnecessary thickness is said to increase the static capacity, a condition to be avoided.

* * * *

Occasionally brushing the threads of spark plugs, valve port caps and exhaust pipe connections with graphite paste will prevent their seizing or binding on the threads from the oxidizing action of the hot gases.

* * * *

Pure castor oil makes the best lubricator for use in the timer.

* * * *

Non-reversible steering gears usually have a certain amount of back lash, which allows the wheels to follow ruts without side resistance on the tires.

* * * *

The average life of a plain piston ring, made of slightly softer metal than the cylinder, is said to be about 10,000 miles.

* * * *

If pistons pump oil and the spark plugs are continually oil soaked, drill holes in the oil ring groove behind lower ring.

* * * *

Excessive tension on clutch spring causes undue strain on ball thrust bearing.

* * * *

Clutch spinning, which often makes gear shifting difficult, is frequently due to excessive friction in spring thrust bearing.

* * *

Be as cordial with customers as possible, but never be so excessive in the demonstration that you will be suspected of insincerity.

* * *

If wishing is praying some people are praying nearly all the time; and without getting their knees dusty.

* * *

Lots of men who claim to have come from fine families appear to be a long way from home.

* * *

Familiarity breeds contempt of advice also. Nearly every one prefers to accept it from strangers.

* * *

A person who could really read human minds would be privileged to gaze on some correct imitations of chaos.

* * *

Give the public the impression that your business is big and growing, and it will seem logical to them that you can sell more cheaply than the other fellows.

WHAT JONES DID TO CLARK'S BUSINESS

(Continued from page 26)

avoided by the women folks of the fashionable trade if a separate apartment were provided. So argued Jones, and in a few days he had a section partitioned off where a woman could enter and make her purchase or order her car cleaned or repaired or conduct any business necessary, without mingling with the common herd. A few chairs were put in, some draperies hung, and for the first few days some flowers were placed on the counter, but they faded quickly and the greenhouse idea was abandoned. A fair share of the stock was put into this new section and the place was ready for business.

THE WOMAN'S SECTION NOT MUCH OF A SUCCESS

No matter how efficient a man may be, if he undertakes to try a number of schemes for increasing business, some of the schemes are sure to fail. The plan of having a woman's section in the establishment failed to come up to the expectations of Jones, and Clark was not backward in saying "I told you so." It was soon discovered that the average woman preferred to go into the main store to conduct any business in hand. The modern woman is different from the woman of the period before the war. The war was the means of making the woman more independent. Many women put on overalls and worked at men's jobs during the war and some are doing that now. The advent of the automobile has had a tendency to make women more independent. All remember that when automobiles were first introduced, a woman seldom operated one. Today the women manage speedy automobiles with the same skill and care as men. Many women are capable of putting on a tire and making adjustments of the mechanism of the motor. They enter the races and they are credited with no more accidents than men.

If Jones had installed his woman's section ten years ago, it might have been appreciated. When opened it was not, although it was given a fair trial, it was well advertised, and when women entered the main door they were politely referred to the women's section, only to glance at it in most cases, and mingle with the men in the main office or store for the purpose of conducting whatever business they had in mind. So the apartment was closed and other efforts made to attract the business of the four hundred.

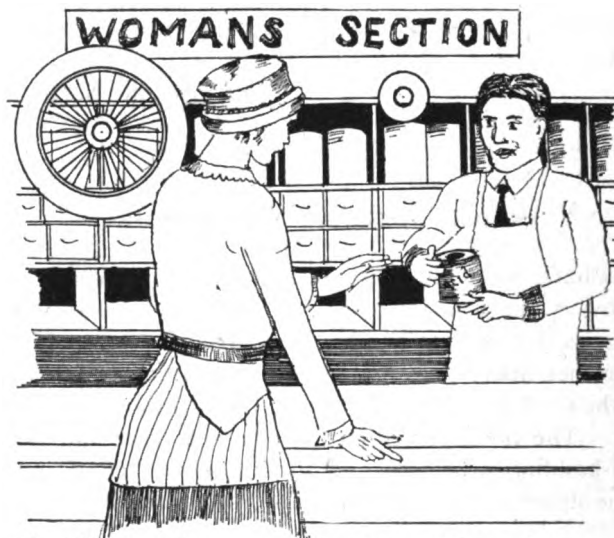
DIFFERENCE IN BEST TRADE AND SHAM TRADE

Jones knew that there were two kinds of people in the fashionable class, one of which would come under the heading of the best trade and the other the sham trade. The best trade would consist of the fashionable class actually possessing riches and the sham trade would consist of the fashionable class not possessing riches but desiring to appear rich. Often the people who do not have the money are anxious that the car they buy or the work they have done shall carry the money value on its surface. They want everyone to think they are rich, al-

though their cars may have been purchased second hand or on the installment plan. They want to make a show.

But Jones knew that the business of both these classes was what he wanted, for while the rich are more able to pay, the sham rich manage to get by in some way, even if they curtail on the rent of their homes or the cost of the food for the table. They may make a suit of clothes last over, but the car must have its annual overhauling and replacements of latest innovations. The newest types of shields, improved lighting devices, better brake linings, new cushions, and perhaps a new top are in just as much demand by the poor rich autoists as the real rich.

Jones concluded to treat them all alike. Through the generosity of the postman and some of the merchants of the town he procured the names and the addresses of the several millionaires, the hundred or so wealthy families, and the many would-be rich of the fashionable stamp and sent them notices through the mails of what was available and what was contemplated.



The addition of a woman's section did not help.

Arrangements had been made to take the agency for the sale of one of the most popular cars, new equipment had been ordered for the repair shop, plans were under way to increase the size of and improve the storage space for cars in the garage, the sales department was to be extended. These facts and others were detailed in the notices mailed to the above mentioned people and in addition some good newspaper space was devoted to advertising the plan.

PRIVATE SECRETARIES AND SERVANTS A HANDICAP

Soon after the notices were sent out to the families of the rich and the make-believe rich, persons who proved to be private secretaries and servants appeared. And some of these people had the audacity to intimate that if any business was done by their employers they would expect a commission. It seems that in most cases the mailed literature was guarded with other mail matter by the private secretaries or servants of the fashionable people and never seen by the latter unless the former so-willed. They all had the excuse that their orders were

not to pass any advertising literature. "We are hired to guard the interest of our employers" they would say. Still, some of them were willing to put the printed notices in the hands of their employers, providing a rake off could be assured on sales or repair service. Jones refused to compromise on the commission plan, but it was not long before he found it to be the interest of the business to do so. If the chauffeur of a rich man brought in a car for repairs, instead of taking it to a competitor, Jones found it the natural thing to hand the chauffeur a good cigar. From the cigar the gift often became a small present. From a small present to a costly one and thence to actual cash in a few cases.

Jones also found it necessary to make his postal literature in a form that could not be considered as advertising if it were to get by the private secretaries and servants of the rich. This problem next received his attention.

Some Income Tax Facts

TO avoid penalty, income tax returns must be filed with the collector of internal revenue for the district in which the taxpayer lives or has principal place of business on or before midnight of March 15, 1923.

Where additional time is required because of illness or absence of the taxpayer from home, the collector may grant, upon application before the return is due, March 15, an extension of not to exceed 30 days. If an accurate period, a request for a further extension must be made to return cannot be made within the 30 days' extension the Commissioner of Internal Revenue, Washington, D. C. Collectors have not authority to grant an extension exceeding 30 days.

Failure to make a return on time subjects the delinquent to a penalty of \$1,000 and an additional penalty of 25 per cent of the amount of tax due. If the failure is willful, however, or an attempt is made to evade the tax by filing a false return, the offender is liable to imprisonment and to a fine of not more than \$10,000 and costs, in addition to a penalty of 50 per cent of the amount of tax evaded.

IN MAKING out his income tax return for the year 1922, the taxpayer is required to include all items of gross income. In the case of a storekeeper the gross income consists usually of the gross profits on sales together with income from other sources. The returns must show the gross sales, purchases, and cost of goods sold. To reflect net income correctly, and to ascertain gross income, inventories are ordinarily required as of the beginning and end of each taxable year. The professional man, doctor, lawyer, dentist, must include all fees and other compensation for professional services.

The farmer is required to report as gross income all profits derived from the sale or exchange of farm

products, including crops and live stock, whether raised on the farm or purchased and resold. A farmer who rents his farm on the crop sharing basis must report such income for the years in which the crops are sold. Profit obtained from the sale or rental of farm lands also must be reported.

In order that they may obtain full advantage of the deductions from gross income to which they are entitled, taxpayers are advised by collectors of internal revenue to study carefully the instructions on the forms for making returns under the head "Income from Business or Profession."

LIABILITY to file an income tax return for the year 1922 is determined by a person's status on the last day of the taxable year, December 31, if the return is made on the calendar year basis, as most are. If on that date he was single he must file a return if his net income for 1922 was \$1,000 or more, and he is allowed only an exemption of \$1,000. If he was married on December 31 he is granted the exemption allowed a married person for the full year, \$2,500 if his net income was \$5,000 or less, and \$2,000 if his net income exceed \$5,000. The bride's income, however, must be considered with that of her husband, the larger exemptions being allowed married couples living together. A widow or widower whose spouse died before the end of the year is classed as a single person. Divorcees and persons separated by mutual consent also are classed as single persons. Divorcees and persons separated by mutual consent also are classed as single persons.

Similar conditions exist with respect to the head of a family. If, during the year, his support of relatives ceased he is entitled only to the \$1,000 exemption. A man who has a dependent child, not mentally or physically defective, who attains the age of 18 years just before the close of the taxable year, cannot claim the \$400 credit for a dependent.

OUTWITTING ZERO WEATHER

London, Ont., automobiles are "sitting pretty" this winter as the result of a novel scheme worked out by a local light and power company for cars parked in the open. The company has placed taps on light poles at regular intervals, and any car owner desiring special heating service pays an annual fee for a key, connecting cord, and electric engine heater. The engine is kept warm in zero weather by connecting the cord and heater to the nearest pole.

THE NEW DAIRY MAID

He—"What do you do for a living?"

She—"I'm a dairy maid in a candy kitchen."

He—"Dairy maid in a candy kitchen. What do you do?"

She (bashfully)—"Milk chocolates."

—Rochester Retailer.

(Continued from page 33)

Accordingly, before the work is taken off the lathe, we may round the top of the thread. This rounding may be done with a metal tool, such as a fine file. Or, it may be done sometimes with emery paper or emery cloth.

Examine the drawing and note the letter P. It represents the distance from the top of one thread to the top of the next. This is the *pitch*. In the United States and England, the pitch of a screw will probably be stated in terms of the inch. The pitch of a certain screw is $1/16$ inch or $1/12$ inch or some other fraction of an inch.

If we know the pitch, we can readily determine the number of threads per inch of the screw. Thus, if the pitch is $1/16$ inch, then the number of threads to the inch is just 16. Similarly, if we are told that there are 14 threads to the inch, we readily determine that $1/14$ inch is the pitch.

We divide 1 by the pitch to get the number of threads per inch. We divide 1 by the number to get the pitch. You can test your answer thus. Multiply the pitch by the number. If the result is 1, you are right. Thus, in one of the examples, we are in effect told that there are 14 threads to the inch. We get $1/14$ as our answer for the pitch. To prove that it is right we simply multiply the 14 by the $1/14$. The result is 1, which shows that the answer is correct.

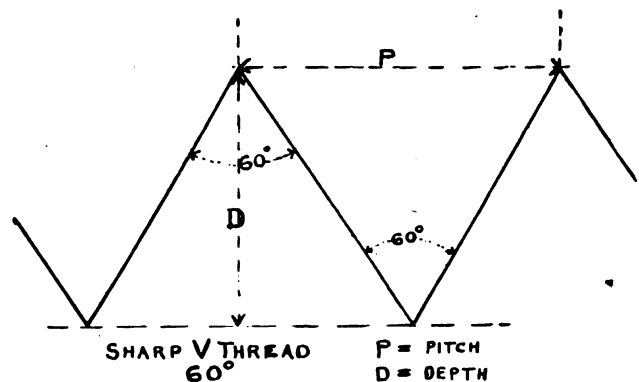
The *depth* of the thread is indicated by D. It is the altitude of the triangle. We can measure it on the thread or in the groove. See the drawing.

If we are handed a machine screw and asked to determine the depth of the groove, we do not have an easy job at all. There are ways of doing it, but they are hardly easy ones, if we want to know the depth accurately. However, if we want a fairly correct answer, we may proceed as follows. We prepare a *thin* strip of metal that is not too hard. Brass, zinc, aluminum are all suitable. We may then sharpen one edge until we get a sharp knife edge. We then force this against the screw until the knife edge reaches the bottom of the groove. The strip of metal must be held so that if extended into the screw it would pass through the axis.

Another and a better way, perhaps, is to use the screw which operates to move the tool post backward and forward as a micrometer screw. That is, we find out the pitch of this screw. To do this, we count the number of turns required of the hand wheel to make the tool post advance 1 inch. When we get this number, we divide 1 by it and this will be the pitch. For example, suppose that the screw used to feed the tool post perpendicularly to the work requires to be turned 20 times in order to get an advance of 1 inch. Then this number is the number of threads per inch. We divide 1 by 20 and get $1/20$ inch. Converting this into a decimal, we get .05 inch. We now have a very important piece of information. It means that every complete turn of the hand wheel produces an advance (or retreat) of exactly .05 inch. One-half a turn will give .025. One-quarter of a

turn will mean an advance (or retreat) of one-fourth of .05. This is .0125. And so on.

To get the depth of a screw that is mounted on the lathe, we put a proper tool in the tool post and arrange the shifting device so that when the hand wheel is turned the tool will shift in a line perpendicular to the axis of the screw. Next, we turn the hand wheel until the tip of the tool just touches the top of the thread. The tool is to be one so shaped at its tip as to permit its advance to the very bottom of the groove. Next, we turn the hand wheel until the tip is all the way in. It is necessary to know, as accurately as possible, just how many turns were required to carry the tip from the top of the thread to the bottom of the groove.



There is one more thing—the tool should be arranged as if the groove were to be cut. That is, its cutting edge must be at the exact level of the axis of the screw and it must keep this level when the hand wheel is turned.

Suppose that the hand wheel to be turned just $3\frac{1}{4}$ times. As each turn means .05 inch, we simply multiply .05 by 3.25. When we do this, we get 1.625 inch. This is the depth of the thread.

Try another. Suppose it is the same lathe and the same screw with 20 threads to the inch that is used to shift the tool post. We start then with the knowledge that one complete turn of the hand wheel means just .05 inch. Suppose, now, that $1\frac{1}{4}$ turns carry the tool from the top of thread to the bottom of the groove. We multiply, similarly as before, the .05 by 1.25 and get .0625. This means a thread whose groove depth is just $1/16$ inch.

Now if we do not have a suitable tool—that is, one adapted to cut this very thread—we may substitute something else. Let me explain.

We put into the tool post a thin piece of soft metal, not especially thin. This is to be set with an edge facing the screw mounted on the lathe. The metal piece is to be set horizontal and the top is to be at the exact level of the axis of the screw. When this is all arranged, we turn the hand wheel until the edge of the soft metal just touches the top of the thread. We note the position of the hand wheel. Then we turn it slowly and force the soft metal in until the edge reaches the bottom. We must note the number of turns required to get this result. Suppose it is three-fourths of a turn. Then the depth is $.05 \times .75 = .0375$.

I will now add some remarks for those who wish to do a little thinking. A tool-post method is probably one of the best that the ordinary mechanic can possibly use. The screw which enables the post to be moved in towards the work may then be employed just like the screw in a micrometer. Where difficulty lies is in judging when a wire or other piece of metal secured to the tool-post is in contact with the top of the thread and when at the bottom. Both positions are to be exactly on a level with the axis of the screw. If the workman can properly cover these things, he can get a very good measurement of the depth.

There is still another way. If it is a 60-degree, sharp V thread, then we can first determine the pitch by counting the number of complete turns in one inch of thread and dividing this number into 1. Thus, if there are 14 complete turns to the inch, the pitch is $1/14$ of an inch—that is, .714 inch. The pitch is always to be multiplied by .866, in order to get the depth of a 60-degree-sharp-V thread. So, then, we multiply .714 by .866 and get .618. Accordingly, .618 inch is the depth of this screw thread.

Thread cutting is not the easiest thing there is to understand. Some workmen can do the necessary thinking and others cannot. However, if the reader has not fully understood, let him try reading over again what has been said above.

UNITED MOTOR SERVICE SETS RECORD

IN taking over the servicing of the Hyatt Roller Bearings and New Departure Ball Bearings, United Motors Service made what is undoubtedly a record.

So well had the plans been worked out from the General Offices in Detroit that within a period of 30 hours the stock of these two makes of bearings had been taken over by the twenty Branches of United Motors Service. The work was done between 5 o'clock on a Saturday afternoon and 9 o'clock the following Monday morning. For the convenience of the automobile world, actually no time was lost.

This record was made on September 30 and October 1, and now the company is distributing bearings as smoothly as though these service activities had been in operation for years instead of months, according to Ralph S. Lane, president of the company.

United Motors Service has 6,357 branches, distributor and dealer points of service throughout the United States and Canada. The extent of this service may be more fully appreciated when it is considered that there are but 5,424 incorporated towns or cities in the entire United States. In addition to servicing Hyatt Roller Bearings and New Departure Ball Bearings, this company furnishes authorized factory service on Delco, Klaxon and Remy, on Harrison Radiators, Jaxon rims and rim parts, and AC speedometers.

Show Calendar

HARTFORD, Conn.—Automobile Show, auspices of the Hartford Automobile Dealers' Assn., State Armory, Arthur Fifott, manager; February.

MINNEAPOLIS, Minn.—Annual Automobile Show, auspices of the Minneapolis Automobile Trade Assn., W. R. Wilmot, manager; Feb. 3-10.

NEW YORK, N. Y.—Annual Automobile Show, auspices of the Brooklyn Motor Vehicle Dealers' Assn., 23 Regiment Armory; Feb. 24-Mar. 3.

SYRACUSE, N. Y.—Annual Automobile Show, auspices of the Syracuse Automobile Dealers' Assn.; Feb. 26-Mar. 3.

NEWARK, N. J.—Annual Automobile Show, auspices of the Newark Auto Trade Assn., Claude E. Holgate, manager; Mar. 10-17.

BOSTON, Mass.—Passenger Car, Truck and Accessory Show, auspices of the Boston Automobile Dealers' Assn., Mechanics Building, Chester I. Campbell, manager; Mar. 10-17.

ATLANTA, Ga.—3rd Annual Great Southern Automobile Show, City Auditorium. Passenger cars and accessories. V. W. Shepard, Mgr., 22 Edgewood Ave.; February 17-24.

PORTLAND, Ore.—14th Annual Show of Automobile Dealers' Association of Portland. Municipal Auditorium. Passenger cars, trucks, tractors and accessories. Ralph J. Staehli, 424 Henry Building; Feb. 12-19.

WINNIPEG, Man.—Third Annual Automotive Equipment Show. Radio exhibits in connection. Under the auspices of the Western Canada Automotive Equipment Association. W. L. Williams, Secretary, Box 3164, Winnipeg.; Feb. 5-10.

MONTREAL, Canada.—1923 Montreal Motor Show, under auspices of Montreal Automobile Trade Association, Almy's Building, Montreal, Jan. 20 to 27. Adelstan Levesque, Mgr., 115 Stanley St., Montreal.

WASHINGTON, D. C.—Third Annual Spring Show, Washington Automotive Trade Association, Rudolph Jose, Chairman Show Committee, 1138 Connecticut Ave.; March 10th to 17th.

STEADY EMPLOYMENT

Smith—"Who are you working for now?"

Jones—"Same people—wife and five children."

—Rochester Retailer.

When man's stomach works harder than his hands, everything will become a bore to him sooner or later.

Measuring Light

THE fact that hollow spheres can be used for measuring the total light given by a lamp has been known for some time, but recently their use has increased very greatly because the new gas-filled lamps which have an irregular shaped coil filament cannot be very well measured with any other apparatus. Consequently, every factory and laboratory which wishes to make accurate measurements of such lamps has to have a sphere.

The Bureau of Standards at Washington has, therefore, issued Scientific Paper No. 447, describing a large sphere built at that Bureau and giving a complete explanation of the theory of spheres as light measurers and of the precautions which must be taken in order not to make mistakes when using them. The particular sphere described is 88 inches in diameter and weighs about a ton, but for different purposes spheres from 3 inches to 10 feet in diameter have been used. Some of these, for example, are made as attachments for pocket size "Illuminameters" and are carried about to measure the reflections from walls and ceilings and from samples of paper, paint, and other materials, while modified forms on a large scale have been used to catch the beams from full sized army search lights and measure the light in them.

If we wish to know the total amount of light given off by a lamp, we must not be content with measuring the candlepower in one direction only. We must measure it all about the lamp in many directions and take an average of the results. Actually to measure lamps of many different directions would require an enormous amount of time and work, and several ingenious devices to get the same result with less labor have been invented. One of the simplest and most satisfactory of these is the integrating sphere mentioned above. This is simply a large, hollow, white-walled ball, inside which a lamp can be placed with a small window so that the brightness of the inside wall can be observed. The light is reflected back and forth between different parts of the white surface, and the sphere has the peculiar property that every part of its surface automatically sends to every other part exactly the right fraction of the light, so that the reflected light falling on the window correctly represents the total amount of light produced by the lamp.

This is true even when the lamp gives all its light upward or downward or in any other direction as well as when the light is given off in all directions. Consequently, a single measurement of the brightness of this window shows the total light given by the lamp.

Luck at cards may run in streaks but in business it follows the greatest display of energy.

Don't underestimate the importance of the small competitor. Most successful merchants start small.

Sixth Annual Convention National Automobile Dealers Association Chicago, Jan. 27-30

FIRST returns from a survey on the "cost of doing business" in the retailing of automobiles, are in process of compilation by the National Automobile Dealers Association which is conducting a brief research on this subject. "Cost of doing business" was the subject of a discussion by Richard Lennihan, Assistant Director of the Harvard Bureau of Business Administration as one of the outstanding features of the 1924 convention of the National Automobile Dealers Association in Chicago, Jan. 27-30, inclusive. Results from the first returns in the survey were made known to members of the National Association just prior to the convention.

The figures obtained will give some idea of the costs in the automobile business as compared to the costs of doing business in other fields. Lennihan will have at its disposal for discussing this subject, the facts established by the Harvard Bureau in its study of the wholesale grocery business, department stores, retail jewelry and retail shoe business.

All of those businesses were studied on the basis of their records for 1921. For eleven years the Bureau has been carrying on a systematic study in the retail shoe trade. This study has shown a steady increase in the accuracy of accounting in this business and a steadily widening influence on methods that have much to do with the fixing of overhead costs in the business.

"Inasmuch as the standard classification of accounts is only gradually coming into use, some discrepancies still are found in the methods of classifying expenses in department stores," says the Harvard Bureau, on the study of costs in the department stores.

The report on the retail jewelry trade says that "despite the fact that a substantial number of reports were obtained that could not be used, on the whole the reports received were distinctly superior in quality to those of previous years and indicated that a slow but constant improvement is being made in the accounting methods of the retail jewelry trade.

These three reports show that all organized business is trying to learn as much as possible about accounting and cost keeping. The N. A. D. A. has recently brought out a simplified system for use in the automobile business. Details of the system will be given to the convention as a part of the Monday morning study of "Costs of Doing Business." The figures from the first survey by the N. A. D. A. indicate that there is not in the automobile business any widely harmonious policy of cost accounting and cost charging. It is these differences which cause much of the confusion in the automobile business and probably has been some reason for the public's failure to reconcile different retail prices in different parts of the country. Officials of the N. A. D. A. hope that this study of costs will pave the way for a very thorough study of this subject throughout the automobile industry in 1923.

TROUBLE DEPARTMENT

This department is intended as a "Trouble Clearing House" for our readers. Correspondents are requested to give the fullest information in every case, so that replies may be made intelligently and be of value to others, as well.

All letters will be answered as promptly as possible, but we would remind our readers that some of the information asked for by correspondents is not always "on tap" and if time is required in securing the desired facts a reasonable delay in answers must be expected.

Readers are requested to make criticism and comment or to freely discuss any subject of interest to the automobile mechanic, owner or operator. This is your own department and you can make it just as interesting and valuable as you will.

Wiring diagrams will no longer be printed, but will be furnished by mail when requested.

CADMIUM TESTING

3174—From D. O'Brien, Mich.: Will you please explain to me the manner of testing storage batteries with the cadmium tester, and also how much the cells should register.

Reply: The cadmium test should be made when the voltage drops to 1.7 per cell on discharge before the battery has delivered its rated ampere-hour capacity at the five-hour rate when a discharge is made, also when a battery being charged does not come up to at least 2.5 or 2.7 per cell and the specific gravity to 1.280 or 1.300.

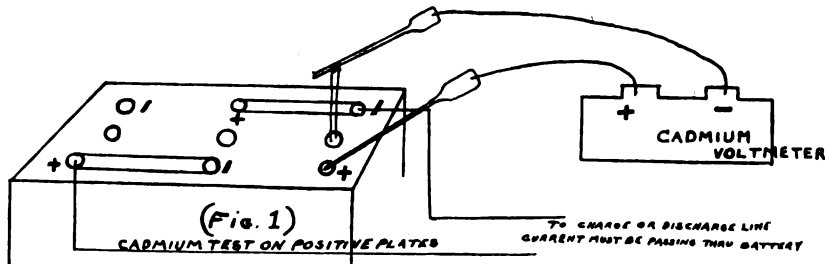
Cadmium tests should be made only when the battery is on charge or discharge. Open circuit readings are not reliable.

To test the positive group of plates in a cell, insert the cadmium stick in the vent hole of the cell to be tested. Be sure, however, that it does not touch the plates. Fig. 1 shows method of testing positives. Press spike into the positive terminal of cell to be tested.

The voltage should become constant before reading is taken. If positive plates are in good shape the voltage should register between 2.30 and 2.50. If lower it indicates defective plates.

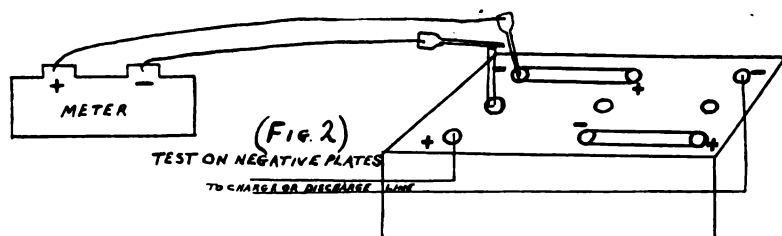
volts, to left of zero. If zero or a reading to right of zero is shown, it will indicate defective plates.

If both positive and negative tests give readings about zero, it is an indication of a short circuit. A minus reading on the negative plates does not necessarily indicate that the battery is charged to capacity. This is ascertained by a discharge test.



DISCHARGE TEST

The battery should be discharged at the normal rate until the voltage registers about 1.8 per cell with the current flowing and a record of the time required should be kept. Then with a five ampere discharged current flowing, the test should be made. The positive plates should give a reading of about 2.05 volts and the negative plates about 0.25. If the positive reading is



When testing negative plates, change the position of cadmium stick (see Fig. 2). The reading is now taken from scale to left of zero. Fully charged negative plates will show a reading between one and two

considerably below two volts, it is an indication of defective plates. If the reading of the negative plates is more than 0.25 it is likely that negative group of plates is also defective.

When defective plates are indicated it is necessary to make a careful examination of them.

When the battery reaches a voltage of 1.8 volts per cell it should have given its rated ampere-hour capacity. This may be determined by multiplying the ampere-hour capacity by the time in hours. If the full capacity is not given it is most likely that either one or both groups of plates will be found defective.

If the cadmium reading indicates fully charged plates, the density of the electrolyte should be determined. It should be about 1.275 or 1.300.

Cadmium tests are usually made when hydrometer tests show full charge, but battery voltage drops rapidly when battery is put in service and it fails to deliver its capacity. It is also made when battery on charge fails to come up to 2.6 volts per cell and its specific gravity to 1.280 or 1.300. The test is usually made while the battery is on charging line. The charging rate is given by the manufacturer and the battery should be charged until voltage and specific gravity attain a constant value.

3175—From R. C. Phipps, Pa.: Kindly describe the Packard Fuelizer in your next issue.

Reply: The Packard Fuelizer is a small combustion chamber surrounding the intake manifold, to which chamber a minute quantity of gas is conveyed direct from the carburetor by means of a small bypass. This gas is ignited in the small combustion chamber by a separate and independent spark plug, and circulates at high temperature through the fuelizer. At the bottom of the fuelizer chamber are two small openings through which this superheated gas exhaust is introduced into the main inlet manifold. This is a means of raising the temperature in the intake manifold by mixing with the fuelizer gas and the heat generated in the fuelizer chamber. All gas passing through the main intake manifold is therefore thoroughly dried and broken up and the motor is fed a completely combustible gas, which it is said explodes without leaving any traces of carbon or other deposits.

The circulation of gas through the fuelizer chamber is maintained by the cylinder suction which draws gas through the main

manifold. The circulation of the gas through the fuelizer starts below the butterfly valve of the carburetor and exhausts into the main manifold. When the butterfly valve is closed the suction is very strong in the fuelizer and a maximum of heat is generated. The farther the butterfly valve is opened, the less suction is effective in the fuelizer, and this automatically shuts off the fuelizer as the engine warms up from speed or action on low gears.

3176—From J. A. Blair, N. Y.: I am having some trouble getting pistons for a 1914 Imperial car, model 47. I intend to have the cylinders reground and it will be necessary to have oversize pistons, or pistons in the rough. Could you advise me what to do?

Reply: If you cannot obtain the proper oversize pistons from the car makers or from a parts supply house, you will of course have to secure them from some firm that will make just the size you desire. After cylinders are ground you can take the necessary measurements and secure prices from different makers. There are a number of firms that make a specialty of supplying oversize pistons and you should have no trouble in getting just what you desire.

3177—From A. W. L., Kans.: How can I tell when cylinders should be enlarged, or reground?

Reply: Cylinders that are badly cut or scored, or are out of round more than .003 in., should be rebored and the necessary oversize pistons fitted.

3178—From H. J. Philips, Conn.: Will it be all right for me to lap oversize pistons to worn cylinders?

Reply: Lapping may improve conditions somewhat, but it will be impossible for you to make cylinders perfectly round, if they are out. If the cylinders are round and the pistons too small, install oversize pistons.

3179—From C. E. Willis, Ind.: How can I test the high tension winding of magneto armature, to find out if there is punctured insulation, and how would this condition be indicated?

Reply: Punctured insulation on the high tension wire winding would result in weak spark, and if the condition is very bad a spark would likely jump from where insulation is punctured to other winding

causing a short circuit and probably putting the armature out of business altogether.

3180—From J. C. Kurtin, Md.: Would you advise using a 32 x 3 tube in a 32 x 3½ casing; I have been told it would be all right to do this.

Reply: We would not advise using the 32 x 3 tube in your 32 x 3½ casing. It would be best to secure what is called an oversize, or 32 x 4 tube. This would give better and longer service. It is not a good plan to use tubes that must be greatly distended to fit the casing.

3181—From G. M. Ross, Va.: What kind of a bearing is an annular ball bearing? Please explain this to me.

Reply: An annular ball bearing is ring shaped. The balls on an annular bearing move around the center of the inner race. They carry the load radially but do not take care of the thrust load. The bearing known as a cup and cone bearing can be adjusted and will carry a thrust load as well as a radial load.

REPAIR SHOP EQUIPMENT AND MOTOR ACCESSORIES

MOTOR WHEEL CORPORATION BUYS DISTEEL WHEEL

Following the purchase of the Distee wheel business of the Detroit Pressed Steel Co., by the Motor Wheel Corporation of Lansing, Mich., arrangements have been concluded for the uninterrupted operation of the Detroit Distee plant under Motor Wheel control.

In explanation of the purchase of the Distee interests, Motor Wheel Corporation officials state that they are building their manufacturing program in accordance with the pronounced trend toward steel wheels exhibited at the New York and Chicago automobile shows, where more than one-third of all cars on display were mounted on wheels of this type.

Also, state Motor Wheel officials, they are now enabled to market, in addition to a demountable rim type of steel wheel, such as they have been building for some time under the Tuarc trademark, a steel wheel which is demountable at the hub, involving the carrying of a fifth wheel on the car.

With the acquisition of Distee, the

Motor Wheel Corporation becomes the dominant factor in the steel wheel industry. Seventeen of the most prominent motor car manufacturers specify Tuarc wheels as standard equipment on one or more models, while eighteen more use Distees. Among the former are such makers as Buick, Cole, Columbia, Essex, Gardner, Hudson, Jewett, Liberty, Oakland, Oldsmobile, Packard, Paige, Reo, Rickenbacker and Westcott. Those using Distee are Anderson, Auburn, Checker Cab, Cadillac, Chandler, Cunningham, Davis, Durant, Handley, Elcar, Hupmobile, Haynes, Marmon, Moon, McFarlan, Pierce-Arrow, Roamer and Yellow Cab.

At the recent New York automobile show, out of 325 cars and chassis on display, 119 were shown on Motor Wheel equipment of wood or steel, including Distee.

And of the 76 manufacturers who participated in the New York show as members of the National Automobile Chamber of Commerce, more than twice as many regularly employ Motor Wheel steel wheels alone than all types of any other make, including wood, steel and wire.

BOSCH ANNOUNCES NEW FORD IGNITION SYSTEM

Dealers and Ford owners throughout the country will be greatly interested to learn that the American Bosch Magneto Corporation has just placed on the market a complete new Ignition System for Fords, at a very low price.

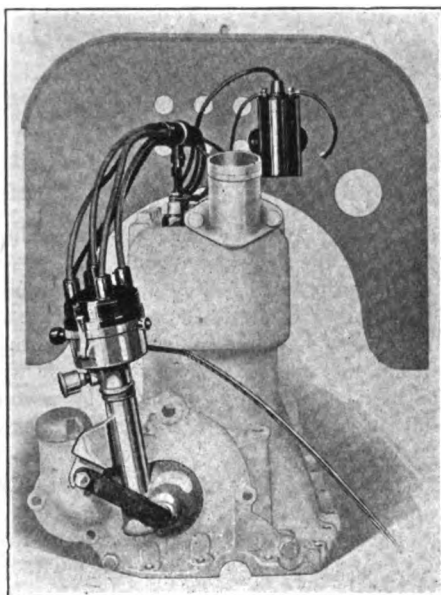
This is quite an achievement for the Bosch Corporation, as the new system is of uniformly high Bosch quality, and yet so simple in design that it can be sold for less than the price of a Ford tire. Unquestionably the new Bosch Ignition System, which is known as Type 600, will enjoy a wide popularity. Tests have shown it to be a remarkably efficient system, greatly improving the operation of the Ford engine. It delivers an intense, extremely hot spark that is perfectly timed, insuring efficient operation of the engine—making it smooth, flexible and powerful.

The Type 600 has new and improved features which distinguish it readily from the other Ford Ignition Systems already on the market. It uses the regulation Bosch Interrupter Cup, or Timer, and has a cle-

erly designed governor for regulating the spark automatically. It is mounted at the front of the Ford engine, being driven from the Ford cam shaft by steel spiral gears furnished with the Bosch outfit. It is kept absolutely rigid, and securely locked to the engine, by means of a forked arm which fastens under the head of the timer clamp bolt.

The manual advance of the spark is controlled by a rotating timer housing. An added feature is the metal plate covering the opening in the timer shaft, holding the grease packing in place and excluding all dirt and foreign substance.

The new Bosch fitting is suitable for all Ford models. It can use the Ford fly-wheel magneto as a source of ignition current, or can get its "juice" from the bat-



tery, if the car is equipped with starting and lighting. This outfit uses one Ford coil, the other three being held in reserve. If desired, however, the Bosch Coil can be supplied with the fitting at a slight extra charge for the entire outfit. Cables, cable tube, control rod and all necessary appliances are supplied with the system.

The Bosch Corporation already has on the market a remarkably efficient Ignition System for Fords—it is known as a Compensating Ignition System. The new system is not designed to replace this Compensating Ignition System, but to provide a lower priced ignition device that will appeal to Ford owners not caring to pay the price of the system with the Compensating Governor.

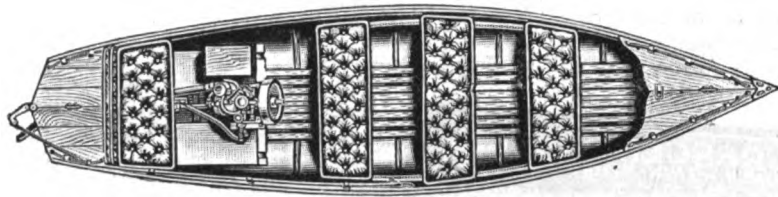
Inquiries should be addressed to the American Bosch. Magneto Corporation, Springfield, Mass., and correspondents should mention this magazine when writing.

A NEW TYPE OF LAUNCH AT A VERY LOW PRICE

The recent announcement of a new type of 16-Foot Launch for family use at a very moderate price, has created quite a

sensation among boat builders and those who are interested in boating.

This new type of Mullins 16-Ft. Steel Launch was designed especially for family use. It has been designed primarily to give comfort, service and satisfaction,



rather than speed, yet its speed of 9 miles is ample for ordinary family use.

The announcement of this new type of launch marks a decided advance in motor boat construction. The dimensions are as follows:

Length 16 feet, beam 4 feet, draft 12 inches, length of cockpit 11 feet 4 inches, and it seats eight persons comfortably. It is equipped with a three horse power Lockwood-Ash single cylinder, two cycle motor; Shebler carburetor; vertical contact timer; mixture oiling system; solid bronze propeller; Mullins Silent Underwater Exhaust, and shoe steel protector for shaft and propeller.

The power plant is sturdily constructed and excels in its simplicity, ease of operation, high efficiency and dependability.

The frame is of heavy oak keel and steam-bent ribs. The bow and stern posts are of air-dried oak. Steel channel ribs are placed under the motor, to which the motor base is secured and braced.

The hull is of heavy gauge, new process, galvanized steel plates pressed rigidly to true form by powerful drop die presses, counter-sunk, riveted and soldered, which gives practically a welded joint and makes leaking impossible. This insures a dry, clean and comfortable boat, always ready for instant use.

The Mullins 16-Foot Special is equipped with air-tight compartments in each end like a life boat, insuring the greatest possible degree of safety.

The deck is of specially constructed oak covering, and protects the air-tight compartments and gasoline tank.

A handsome catalog, attractively illustrated in four colors, which illustrates and describes their complete line, will be mailed on request to anyone who is interested in launches, motor boats, row boats, hunting or fishing boats, by the Mullins Body Corporation, Salem, Ohio.

NEW STEERING POST CONTROL FOR FORDS

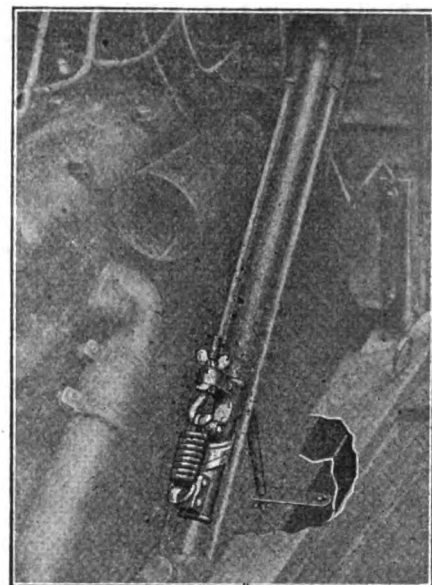
Ford car owners who have had to "hang on" to their steering wheels when driving over rough roads, car tracks, or through fresh gravel, will appreciate a new device, just placed on the market by the Exlo Products Company, Indianapolis, which is

designed to eliminate all the wobble from the Ford front wheels and insure perfect driving control. The invention is known as the Exlo Steering Post Control and may be installed on any Ford car in a few minutes, without replacing or changing any

of the Ford standard equipment.

It enables the Ford driver to steer and handle his car with as much ease as if it were equipped with a worm gear steering post, such as is used on higher priced cars, and yet it does not eliminate the flexibility of the Ford steering gear. It is said to absorb the road jars and keep the front wheels constantly in line, until they are turned by the driver. It is claimed to reduce steering strain, as only slight pressure on the wheel is required to drive the car. The device is designed to diminish wear on the front tires and steering knuckle bushings, and to prevent the wheels cramping when turning sharply.

It is constructed of cast bronze, and



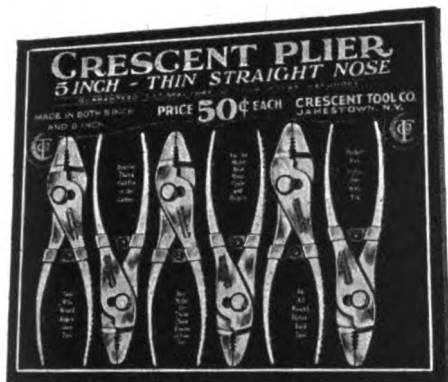
clamps around the steering post, and its two parts form a cam which act when the steering wheel is turned. Tension between the two parts is supplied by an adjustable coil spring. The device retails for \$7.50 and carries liberal discounts to the trade.

DIE CASTINGS

The Mt. Vernon Die Casting Corporation of Mt. Vernon, N. Y. is prepared to furnish the trade with die castings of every description. Prompt delivery is guaranteed and any who are interested should send sample blue-prints of sketches for estimates direct to this company.

NEW CRESCENT DISPLAY BOARD MAKES HIT!

The large quartered-oak display boards used in connection with the famous Crescent Wrenches are already familiar to the hardware trade, and only a little less familiar to the auto trade. Now there is a smaller brother of the wrench board afloat. It exhibits six of the new Cres-



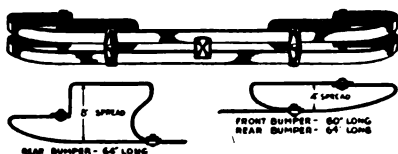
cent thin straight nose pliers, 5-inch size, and is fitted with a brace so it will stand on a counter or show case. Dealers and garages are finding it one of the liveliest salesmen they ever had in the store. The known reputation of the Crescent line, and the Crescent guarantee of "satisfaction or your money back" makes the customer sure of the quality of this neat-appearing tool. Their handiness is obvious. The pliers on the board are the new type, designed especially for use by women. This is the first time a plier has been made with an especial appeal to the woman motorist. They are strong enough to stand any kind of use, yet have the fine finish that appeals so much to all customers. The pliers retail for fifty cents apiece.

The 5-inch pliers are so affixed to the board that they cannot be stolen and an equal number of the 6-inch size are packed in individual cartons and included with the assortment.

GEMCO PARA-MOUNT BUMPER

The cut gives some idea of this new bumper, which has just been placed on the market by the Gemco Manufacturing Co. of Milwaukee, Wis.

Its beauty of design and strength of



material—fashioned and finished by skillful workmen—answers a long felt want in the offering of a right Bumper combination—real car protection with added car attractiveness. The Para-mount is in a class by itself and regardless of price will meet the approval of all exacting buyers.

The ends of the parallel bars curve gracefully inward and are fastened to steel extensions on which the brackets are attached. The bars are held firmly in position by specially designed clamps. The ornamental clamp in the center has the same design as found on all Gemco Bumpers.

The bars are finished with an exceptionally high quality nickel by a special process which makes them practically rust-proof. The bumper is made of the finest grade of spring-steel, oil tempered.

REFLEX INTRODUCES THE TORPEDO REFLEX SPARK PLUG

The Reflex Ignition Company, of Cleveland, Ohio, have recently placed on the market their new REFLEX TORPEDO SPARK PLUG which was designed specifically for Oil Pumping Motors a condition which has proved to be the most common source of motor trouble.

This plug is of the Closed End Type, a feature which allows only a small amount of oil to enter the spark plug chamber, reducing the short circuiting or carbonizing to a minimum. The rather revolutionary design of the core is that of the porcelain tip which is ball shaped.



This is a construction which holds the heat at the end and in this way insures against fouling.

The construction of the porcelain will be noted in the cut-away illustration. The porcelain having this ball shaped design prevents radiation due to the fact that the shank is smaller in diameter. At each explosion there is a force of ignited gas which is expelled out of a small hole at the bottom of the shell. This actually throws out all oil and carbon from the chamber.

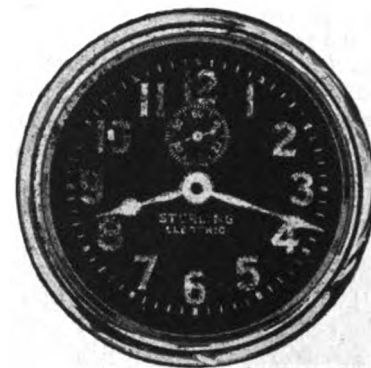
This plug has been put through extremely severe tests and has proved itself to be absolutely correct for oil pumping motors as well as other motor conditions.

Any information desired for facts on this plug, please write Department F The Reflex Ignition Company 3068 West 106th St., Cleveland Ohio.

THE STERLING ELECTRIC AUTO CLOCK

Many attempts have been made to put a satisfactory Electric Automobile Clock on the market. The Sterling Clock Company, No. 220 East 42nd Street, New York City, are the first concern to satisfactorily accomplish this. Their clocks have been in use on automobiles for over two years, and are giving excellent satisfaction.

The REO MOTOR CAR CO. of Lans-



ing, Mich. are now using the Sterling Clock on their various models.

Practically all the large automobile manufacturers are interested in the clock and are testing samples. It is probable that within the next 6 months this clock will be used as standard equipment by a considerable number of the automobile manufacturers.

The STERLING ELECTRIC CLOCK winds automatically on the storage battery of the car. It uses so little current that it has practically no effect on the battery. The clock rewinds once a minute, keeping uniform tension on the main spring, which assures accuracy in time keeping, which is impossible with the usual types of automobile clocks which are rewound every day or once every week.

WELL-KNOWN AUTOMOBILE PRODUCTS HANDLED BY THE KORAX COMPANY

G-PIEL MUFFLER CUT-OUT, TESTING VALVE and PEDAL—manufactured by The G. Piel Company, Long Island City.

NATIONAL LOCK WASHERS—manufactured by the National Lock Washer Company, of Newark.

GREDA—manufactured by the Acheson Graphite Company, of Niagara Falls.

KWIK-AK-SHUN COMPOUNDS—manufactured by the United States Products Company, of Pittsburgh.

JONES ELECTRIC DRILL and PARTS—manufactured by the Jones Drill & Specialty Corporation, of New York City.

All inquiries should be addressed to the Korax Company, 56 West 45th Street, New York City.

HOW ACCIDENTS ARE PREVENTED

In the majority of cases where a man, woman or child is run down by a motor truck or passenger car, the bodies are recovered from a position just back of the front wheels.

This proves that in the second or two

duce the spark in the cylinders. When the ignition system includes a number of contact points, the possibility of such disturbances is correspondingly increased. Many are the motor troubles which frequently may be traced to badly pitted, carbonized or uneven contact surfaces. This is the very first place to investigate after the

effort. The small expenditure for the Anderson Tru-point will quickly be repaid by the saving in new points, and by the smooth, economical, and satisfactory operation of the motor.

The old points, which previously have been thrown away, usually have lots of life in them. They may be re-faced many times with Anderson Tru-point before the metal is entirely used up, and each time they will be equal to a new set.

With the Anderson Tru-Point, the old points, if there is any metal left at all, come through with the surfaces perfectly true, smooth and parallel, the last of which is very important. If they are not parallel, the surfaces will meet only at the edge, and there will be a gap over more than half of the surface. Across this gap, the current will form an arc, burning the surface and forming pits and carbon. In a very short time the condition is as bad as before. On the other hand, if the two surfaces are perfectly parallel, they will meet everywhere, no arc will be formed, and the current will flow better, and give a better spark, than where it must pass through but the two edges of the contacts.

The Anderson Tru-Point is the only tool which will face up the Delco contacts as they should be, and that is just as they are when new. It is guaranteed to do this. Furthermore it is quite rapid, and requires only a few minutes to do the work. It is a tool for the shop, and for the car owner and chauffeur, and will pay for itself in a few months use.



of time available, the drivers have jammed on the brakes and done their utmost to avoid a serious injury or fatality—but failed. It is a fact that the average speed of the car at the time of actual impact in such accidents is but six miles an hour.

When equipped with the Pohlig Automatic Fender, the car's speed could be two or three times as great—practically the maximum driving speed of all trucks—yet the person's body could not get under the wheels.

When a body is struck the fender automatically drops to the ground like a flash of lightning without any action on the part of the driver who is occupied in bringing his car to a full stop. Even before the bumper is struck, the fender has dropped with such speed as to preclude any part of the body being crushed under the wheels of the car.

The trip-bar is positioned below the bumper so that the smallest toddler is tall enough to cause its operation. The fender is the same height above the road as the axle allowing the same road clearance. When struck, the fender drops to the road.

The Pohlig Automatic Fender is manufactured by The Peelle Company, Stewart and Flushing Aves., Brooklyn, N. Y., to whom all inquiries should be addressed.

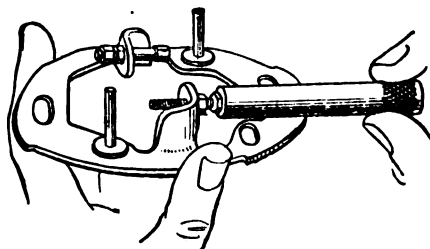
THE ANDERSON TRU-POINT

One of the most common sources of ignition trouble is the contact point where the electric current is interrupted to pro-

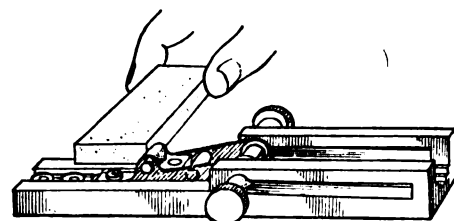
duce the spark in the cylinders.

In order to overcome ignition troubles arising from this, the principal source, Mr. Alfred Anderson, who has devoted many years to the study of motor ignition, devised the Anderson Tru-point, with which the contact points of the Delco System may be kept in perfect condition with a minimum of time and effort. This is an accurate instrument designed to hold both the contact screw and the contact arm of the Delco interrupter and, by a fine adjustment, bring them between the two surfaces of a hardened steel gauge in which they can be faced off perfectly true, and with surfaces absolutely parallel.

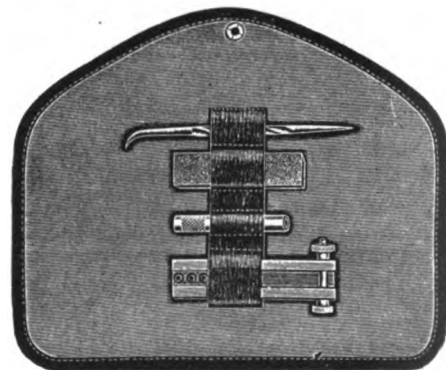
The Anderson Tru-point is put up in a neat leatherette roll convenient to carry in the tool box. The complete kit includes also a socket wrench for removing the contact points, a carborundum stone for re-facing, and a handy awl. The Anderson



Tru-point Tool only may also be obtained separately if desired. With this convenient and accurate little instrument, it is so easy to keep the contact points in proper condition that anyone accustomed to the motor can do the work with little time and



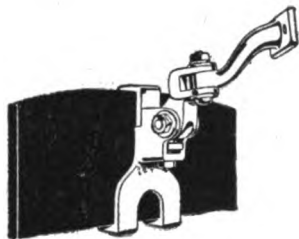
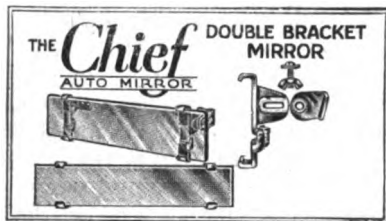
An interesting booklet, fully describing the use of the TRU-POINT will be mailed readers of this magazine who write to the Chas. Stewart Company, 220 Broadway, N. Y.

**NEW DISTRIBUTORS FOR ENSIGN CARBURETORS**

The Distribution of Ensign Carburetors has been taken on by the H. B. Shontz Co., Inc., 161 West 64th St., New York City.

"CHIEF" MIRRORS FOR FORDS

"Chief" mirrors, manufactured by the Britton Auto Products Co., Inc., 117 West 63rd St., New York City, have long been regarded as the standard high grade mirror by accessory dealers. They are substantial



in construction, neat in design, and interchangeable from one car to another. They are adjustable to any angle without the aid of tools and do not vibrate any more than the part of the car to which they are fastened.

Model C. No. 1 is a style especially adapted for the Ford sedan and coupe. The extension arm is so designed that it has a perfect drop, allows generous clearance to the upper half of the windshield when it opens inward and holds the mirror at any angle securely and without the annoyance of rattling.

In "Chief" mirrors, the finest grade of crystal plate glass and silvering is used. The swivel joint bracket is tightened just enough to allow easy but permanent adjustment.

THE ANTHONY (2 in 1) COMBINATION HEEL REST

This is a classy accessory, easily applied with two screws to the floor of a car. A strong, stable rest under the accelerator pedal—a snug fit to the heel of both men and women's shoes.

The Anthony 2 in 1 Combination Heel



Rest is an aluminum casting designed to overcome the one big annoyance experienced by women when driving. It is a safety feature—it locates the pedal correctly under the ball of the foot and insures uniform acceleration.

The Anthony Combination Heel Rest practically perpetuates foot comfort and will easily earn a just dealers' profit besides everlasting good will. One standard model—list price each \$0.50.

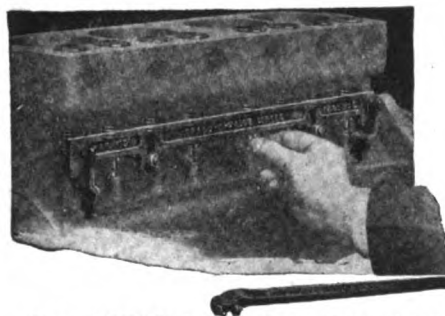
All inquiries should be addressed to The Anthony Company, Long Island City, New York.

SPEED-O MULTIPLE VALVE SPRING LIFTER

Speed-O has been developed not only with the view of placing in the hands of service station mechanics a tool that will enable them to remove a set of valves ten or twenty times faster than other methods permit, but to encourage car owners and chauffeurs to grind their valves and clean the stems when the first knocks develop—not wait until the cylinder walls cake with carbon, causing endless engine trouble; and then be *compelled* to have the job done.

It is no secret that pitted valves and carboned cylinders reduce engine efficiency to an alarming degree, waste gasoline and prove a general nuisance to the operating qualities of the car.

And this emphasizes the 'need for SPEED-O, the Multiple Valve Spring Lifter. Unlike the usual run of valve lifters, SPEED-O banishes the tiresome, temper-testing process of handling but one spring at a time. SPEED-O handles from EIGHT to TWELVE—and with surprisingly little effort.



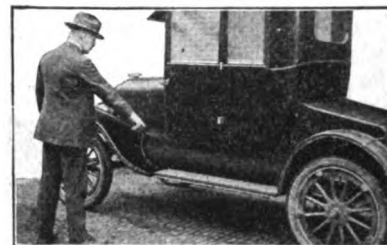
Once SPEED-O has been snapped into place, the springs are quickly compressed—and the valve stem keys are immediately accessible for removal. It takes just thirty seconds to have the valves ready for grinding. In the meantime the springs are held compressed and in place. When the valves are replaced, it is merely necessary to release the SPEED-O crosspiece—and the springs snap back in place. A moment's job.

SPEED-O enables the mechanic to do several jobs in the time it now takes to do one—and he is not discouraged at the prospect. He works in a natural position and doesn't have to contend with the harassing nuisance of removing and replacing valve springs. There are no skinned knuckles—no pinched fingertips. No loss of time or patience.

SPEED-O is equally effective on all types of engines. It is made in various types to fit the different models of cars.

THE BEAR AUTOMATIC DISAPPEARING LUGGAGE CARRIER

Having the "Bear" attached to the running board—made so it is raised or lowered automatically, and held securely in either position, you are not bothered with



taking off or putting on any dirty, cumbersome appliance. You need no wrenches or oil or tools. The "Bear" is easy to operate—a child can do it.

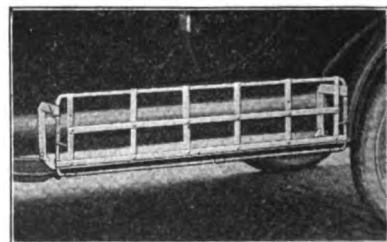
One very desirable feature of the Bear Automatic Disappearing Luggage Carrier, is that it can be put up or put away almost instantly. When you want it up, it can be put up in an instant and is held securely in position. When you are through, simply fold it under, where it is held tightly—free from any rattles.

Mechanically, the Bear Automatic Disappearing Luggage Carrier, is very solidly and sturdily built. It should last the entire life of any car. There are no wearing points, except the hinges, and there is nothing about them to ever wear out.

The cross sections are securely riveted. The end guards prevent the luggage from shifting and rubbing on the fenders. The length is 42 inches.

Summed up, every car owner requires a Luggage Carrier at some time or other. In the "Bear," he has one that meets every requirement when he needs it; disappears and is out of sight when not needed; is instantly placed in position; does not mar the appearance of even the finest car; and finally, can be had at a price that any car owner can easily afford to pay.

The Bear Automatic Disappearing Luggage Carrier can be installed in about fif-



teen or twenty minutes. It then becomes a permanent fixture—is always there. No further bother or adjusting.

Address all inquiries to the manufacturers—Bear Manufacturing Co., Rock Island, Ill.

NEW WHEEL CARRIER MAKES A HARD JOB EASY

Just as the electric starter banished a hard, disagreeable task from motoring, so a new invention, known as the Self-Mounting Carrier, manufactured by the Oakes Company, Indianapolis, eliminates all the back-breaking, clothes-soiling, brute-force work of lifting a heavy disc wheel up



on to the carrier. This has always been a dreaded and often a dangerous task, even for a strong man.

The new device is in reality a sturdy wheel carrier, which takes the place of the ordinary wheel-holder at the rear or side of the car, and a simple lifting and lowering attachment, which enables any one who drives the car to raise or lower the heaviest disc wheel easily, cleanly and with no risk of injury. With this carrier, a wheel may be mounted in a few moments. All the motorist has to do, is to roll the wheel into position beneath the carrier, insert the detachable lifting lever through the hub into the carrier arm, and raise the wheel into place on the carrier by an easy lift, using one hand on the lever and the other to steady the wheel.

When the wheel reaches the carrier, it is held securely by a spring catch while the stud bolts are screwed in and the cover plate applied. A special feature of the new device is the Oakes Spare Wheel Lock, which is installed on the center stud of the carrier, after the cover plate is put on. This lock not only prevents any one stealing the wheel, but adds the finishing touch of neatness to the carrier. This locking feature is considered a great advantage, as a disc wheel and tire represent an investment which few motorists can afford to leave unprotected.

The Self-Mounting Carrier is almost indispensable on heavy and medium-weight cars equipped with steel disc wheels. Already it is being used as factory equipment on Nash Cars having disc wheels, and several other leading car manufacturers are planning to adopt it. Its retail price is \$20.00, including the Oakes Spare Wheel Lock.

CYLINDER STORMIZING

Stormizing is a registered trade name given a new process of refinishing or re-machining engine cylinders introduced by the Storm Manufacturing Company of 406 Sixth Avenue South, Minneapolis, Minnesota.

It is a distinctive machining process designed especially to meet service work conditions. It is not cylinder grinding as ordinarily known to the trade, or as done by the internal grinder; nor is it cylinder reboring, rolling, honing or burnishing alone or as commonly known to the trade.

Stormizing is a process in which the better features of the older service and factory production methods are combined with new improvements.

Stormizing, like a factory production processes, consists of two distinct operations. The first is the machining operation by which the cylinder walls are corrected and made straight, true and in perfect alignment with the crankshaft and other working parts. This is accomplished by a patented cutter head supported by heavy hardened steel boring bar and substantial main bearings. This is then followed by a finishing operation, which leaves an actual working polish such as heretofore has never been attained by any mechanical means.

The patented Finishing Head used is another exclusive feature of the Stormizing machine. It is driven by an ingenious automatic, reversing mechanism which drives the head and feeds it forth and back through the cylinder in the manner that has been found to give perfect results.

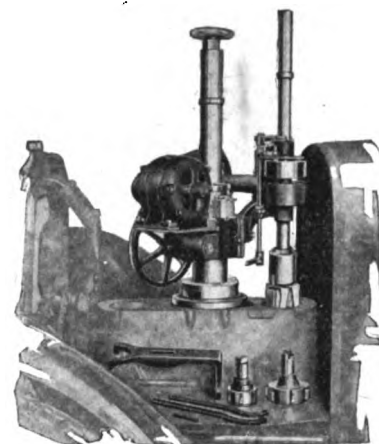
Cylinders will occasionally be encountered that are only slightly and quite uniformly worn. They will be found .002 to .004 inch smaller at the extreme bottom, there being no "ring wear" at that point. Such cylinders can be quickly and effectively renewed by using the grinding or finishing process only but about 80 to 90 per cent of the cylinder that reach the service shop are either scored or worn tapered, curved or out of round. These necessitate the removal of more metal, therefore, for economy and efficiency the complete Stormizing process is brought into play in the majority of cases. Wherever the wear exceeds .004 or .005 or wherever the cylinder is out of round the combined process will be found most practical, as grinding or honing is not an efficient method for removing large quantities of metal.

Stormizing machines are made in three distinct models to meet different shop conditions. The Semi-Portable or medium sized machine is illustrated herewith. This is a very popular model for the average sized shop. It has a heavy machined base which makes it a prominent self-advertising shop fixture and at the same time it can be quickly removed from the base and used as a portable machine for reboring

motors in the chassis wherever this is most convenient.

All Stormizing machines are entirely self-centering and automatic in operation. They are very simple to operate and extremely accurate in their results.

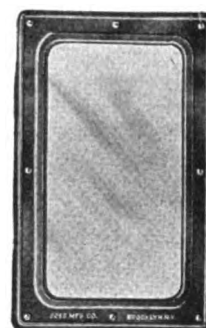
Complete information on Cylinder Stormizing machines may be had by addressing Dept. D. Storm Manufacturing Company, 406 Sixth Avenue South, Minneapolis, Minn.



A NEW FORD LIGHT

The frame illustrated is the result of weeks of intensive experimenting for the sole purpose of creating something different in design that could hold an attractive and durable finish, and which could be produced at a quantity price. This new SOSS Ford Light is a steel stamping finished in a glossy black japan, absolutely rustproof. The outer edges are slightly curled to prevent any possibility of the frame cutting the fabric.

They are packed in sets of three to a cardboard box. A set includes six frames, three clear vision glass lights and 48



screws with complete directions for installation. This light is manufactured by SOSS Manufacturing Company SOSS Building Brooklyn, New York.

NOTICE

In writing to any concern having a reading notice under the head of Repair Shop Equipment, please mention this magazine.

FARRELL HYTOMETER

The accurate oil and gas gauge—shown on the dash. No floats—nothing to stick—no moving parts—nothing to wear—no wires—lasts a lifetime.

The Farrell Gasoline Hytometer shows you at all times how much gasoline you have in the tank. Shows you how much



gasoline to buy, without leaving your seat. Saves you from running out of gas.

The Farrell Oil Hytometer shows you at all times where the oil level is in the crank case. Tells you when to buy oil. Prevents you from buying more oil than necessary, thereby saving many dollars for removing carbon, caused by too much oil in crank case. Eliminates the danger of burning out bearings for lack of oil.

Absolute guarantee with each instrument.

The Farrell Hytometer warns you of leaks. Puts safety and economy into motoring. You don't have to guess or investigate; you always know.

The Farrell Hytometer is adapted to all makes of gasoline or steam automobiles, trucks, or tractors. It has been time and road tested and is indorsed by authorized car dealers.

The price of Ford model is \$6.00. Address all inquiries to Universal Sales Agency, 437 S. Dearborn St., Chicago, Ill.

ROWLAND OPENS IN PARIS

Rowland Advertising Company, Inc., Fisk Building, New York, which handles the advertising of the National Automobile Shows and numerous other industrial expositions, has opened a branch office in Paris, France. George R. Hull, formerly of the New York office, is perfecting an organization with several advertising experts in Paris and is now in charge of Rowland's interests there with headquarters at 25 Rue Taitbout. In addition to handling Rowland's business Hull will operate a printing and poster business.

It was looking forward to this move that Worth Colwell, President of Rowland Advertising Company, accompanied by Mr. Hull, went to Europe in March, 1921. Before attempting to open up with any business abroad in the interest of American clients or otherwise, Mr. Hull spent nearly two years traveling in various European

countries, studying advertising as handled in these respective countries at first hand, and establishing connections in various cities in France, England, Switzerland, Italy, etc.

Either Colwell or Edward F. Korbel, Vice president of the Company, will visit the Paris office for a month or more early in the summer.

"OXY-ACETYLENE WELDING AND CUTTING"

The above is the title of a new book just issued by the Norman W. Henley Publishing Co., New York. It is the sixth revised and enlarged edition by the same author. This edition has been brought right up to date by the addition of much new matter and with many new especially made engravings. It teaches you the care of apparatus, welding of all metals and alloys, how to take care of expansion and contraction, soldering aluminum, repairing scored cylinders and many other things which manufacturers, metal workers, garage men, railroad operators and blacksmiths desire to know.

It covers the complete field in a clear, comprehensive and practical manner, simple enough for the beginner and sufficiently complete for the experienced welder. Right up-to-date in every detail. Latest and most approved methods explained.

This book will be sent postpaid on receipt of the price, \$1.50 by the publishers, located at 2 West 45th St. N. Y. City. Be sure to mention that you saw this notice in the Automobile Dealer & Repairer.

NEW KLAXON OFFICERS

General Motors Corporation announces the following election of officers and directors of the Klaxon Company, Newark, N. J.: William M. Sweet, President; Fred W. Ayers, Vice-President; M. I. Mullen, Secretary and Treasurer. Board of Directors William M. Sweet, Fred W. Ayers, Alfred P. Sloan, Jr., John L. Pratt, John P. Smith.

Fred W. Ayers, who has just been made vice-president has for the last two years been connected with the Klaxon Company as general works manager.

MILBURN WELDING & CUTTING APPARATUS

We wish to acknowledge receipt of a miniature catalog of welding and cutting apparatus from the Alexander Milburn Co., 1416-1428 West Baltimore St., Baltimore, Md. It covers all equipment from the smallest torch to a large compressing plant and it will be sent free on application to every reader of this magazine.

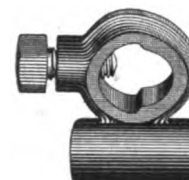
MONGER TERMINALS

The construction is simple. They are easy to connect, they are easy to remove, they make a positive contact, they are stronger. They go over the post easily.

You do not have to pound them on the post—thereby saving the life of the delicate battery plates.

They come off easily. You can remove them with one hand.

You do not need a tool kit to make a



connection or to remove them. One tool, a wrench, is all that you need, either to make the connection or to remove them.

The nut is easily accessible with a wrench, securing the terminal to the post.

Your wrench won't slip off and knock the skin off your knuckles.

All monger terminals will fit either positive or regular posts. For special quantity prices and full information our readers should write to The Central Supply Company, Atchison, Kansas.

A USEFUL CATALOG

We have received a copy of their new catalog from the Burgess-Norton Manufacturing Co., of Geneva, Illinois, makers of piston pins for the trade. It is an attractively printed 40 page pamphlet, which should have a place in the reference library of every auto repair shop. It contains a complete accurate table showing sizes of piston pins for all models and makes of cars. We understand that this catalog will be sent free to any garage proprietor, repair man or mechanic who will write to the manufacturer for it and mention this magazine.

MOTOR CAR DEALERS NOW SELL MOTOR BOATS

Many automobile dealers who are located near lakes or rivers have found it very profitable to sell and service motor boats.

Thousands of men who enjoy boating have hesitated about buying boats because it has been impossible to obtain service, without delays and inconvenience.

One of the largest manufacturers of standardized motor boats advises us that more than half of their Authorized Agencies are motor car dealers, and that they make very satisfactory representatives because they are not only able to supply oil, gasoline and replacement parts, but have competent mechanics who are able to make necessary repairs if the engines happen to get out of order.

COX HYLO BUMPER MODEL 30

The new model 30 Cox Hylo Bumper retains all the features of the full loop spring bumpers manufactured by this company; the bumper has two impact bars the full width of car, and in addition has the single bar in back, which comes into action when the blow is heavy enough to depress the two front bars. The upper and lower front bars are further reinforced by an attractive Cox monogram, or we can furnish special monograms for the popular make cars at \$1.00 extra.

Also, Mo-lyb-den-um Steel—being lighter for the same strength and stronger for the same weight than any other steel enables us to produce a double-rail model that is not heavy or cumbersome.

The two rails have wider faces than ordinary (2 inches each), and the space between them is narrower (only 1 inch), which gives the bumper a very impressive appearance, and the total width of impact surface is sixty inches, from wheel-to-wheel.

But, while giving this impression of unusual width and solidity, the Cox Hylo "30" weighs only 35 lbs.

Its comparatively light weight is due partly to superior design and partly to the high ratio of strength per pound possessed by Mo-lyb-den-um Steel, which steel, you will recall, became famous during the War for its remarkable tensile strength, toughness, hardness and resiliency unequalled by any other steel in the world.

Its impact-resisting qualities have been demonstrated by a collision test of 4225 lbs. more than 1600 pounds greater than the Underwriters' requirements.

The same Cox attachments, custom-built for each particular make of chassis, which permit such quick and easy installations and give Cox Bumpers that appearance of being an integral part of the car itself are included in the price of every Model 30. Nickel plated \$22.00, Black enamel \$20.00, for special monograms \$1.00 extra. Address all inquiries to Cox Brass Mfg. Co., Albany, N. Y.

COMBINATION HAMMER DIE

BEAUDRY & COMPANY, INC. of Boston are bringing out a new combination hammer die for drawing tapers and are prepared to furnish it for any make or size of trip, air or steam hammer, by the use of which one man in one heat can draw about any taper that can be handled under a hammer. As will be seen from illustration one end is provided with a tilting face so supported that it moves freely on a fixed axis, and the operator by merely shifting the position or angle of the work, and striking a light blow automatically adjusts this tilting face to any desired angular position with relation to the top hammer die and thus any desired taper can be given the work and any shaped piece can be completely finished and smoothed up, point and all, without any hand finish.

CAMPBELL LEAVES TUTHILL SPRING CO.

D. S. Campbell who has been associated with Tuthill Spring Co. for over sixteen years has resigned his position as Secretary of the Company. Mr. Campbell is one of the pioneers in merchandising and marketing automobile springs for replacement. As a member of the Automotive Equipment Association and also the Society of Automotive Engineers he has been prominently identified with the notable progress made in things automotive during the last decade. He has not announced his plans for the future.

THE CURRAN ALL METAL RADIATOR COVER

The Curran is all that is necessary for protecting radiators, the hood covers being unnecessary as experience has shown definitely that inside circulating pipes will freeze before the large body of water in the tank or upper part of the radiator. Covering the cells of the radiator serves all purposes.



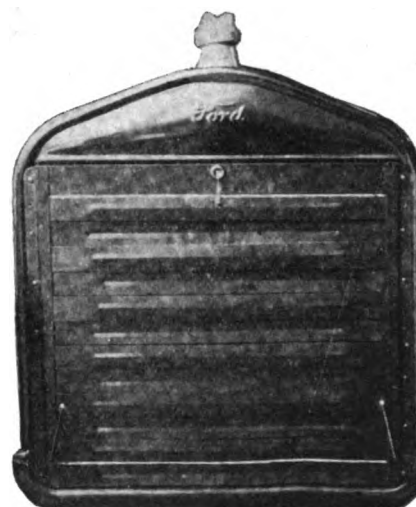
The dash fixture permits of adjustment at any desired point to maintain perfect regulation in any weather.

The Curran sliding front is at rest when driving. There is no strain on the draw wire when open, while on shutter covers, as operated, the draw wire breaks often, as the shutters must be held open against a strong spring when driving.

The smart appearance of the Curran is unexcelled. There are no projecting surfaces to bend, mar or detract from its appearance.

Mud, snow or sleet cannot hinder operation as the sliding surfaces are covered.

Closing is positive against flanges and



laps. There are only two parts.

The Curran can be attached within 15 minutes with 4 padded bolts through radiator and one dash fixture bolt.

Address all inquiries to Liberty Engineering Corporation, 30 Church St., New York City.

FORD OWNERS AND DEALERS DEMAND HIGH GRADE VISOR

The Ford owner may speak lightly of his "Henry" or his "fliver" or his Lizzie," but at heart he is just as proud of his car as though it had 12 cylinders and a \$5,000 price tag.

When it comes to the matter of accessories he wants the best, and is willing to pay the price. In fact he's a better accessory buyer than the average big car owner, because he has been educated to buy many of the comforts and luxuries which come as standard equipment with high priced cars.

The Ford owner's desire for good equipment, and his willingness to pay a fair price for it, was demonstrated recently in the experience of Thoma & Son, Inc., of Fairfield, Iowa, manufacturers of the Sunbeam Visor.

This Visor, which is of high quality, was not made last year for open Fords, in the belief that in quality and price it was out of the buying range of the mass of Ford owners.

As the Sunbeam Visor secured wide publicity and distribution, however, hundreds of letters began to come in from Ford owners and a little later from Ford dealers, asking where the Visor could be obtained for Ford cars.

The company had to answer a tremendous number of such letters before it awoke to the fact that it was in reality passing up a tremendous market for its product, but finally the demand became so insistent, and the interest so marked, that the company's engineers set themselves to the task of designing and manufacturing a high grade colored ribbed glass Visor for Fords.

The result was the "Sunbeam Junior," and so ripe was the market that the first mail announcement to dealers brought a return not in inquiries but orders that absolutely assured the future of a high grade visor for Ford cars.

SOME RECORD

An interesting demonstration of the durability of storage batteries, such as were built for lighting automobiles some years ago, has recently come to the attention of the editor.

A Mr. Baer of 283-7th Avenue, Brooklyn, recently returned to the Marko Storage Battery Company in Brooklyn an eighty ampere hour lighting battery which he had used on his Overland car continuously for the past nine years.

It was still in good working condition, developing 90% of its rated capacity. The original wooden separators were in a state of perfect preservation.

Photographs of this interesting battery and a complete record of its service are given in a leaflet sent out by the Marko Company. They also list many other names, owners of Marko batteries which gave exceptionally long life.

Address all inquiries to Marko Storage Battery Co., Bedford and Jefferson Aves., Brooklyn, N. Y.

DALTON & BALCH, INC., APPOINT ROSENBACH

David Rosenbach announces his resignation as Director of Sales of the Farran-Kinney Company of Chicago to become Manager of Sales for Dalton & Balch, of Chicago, manufacturers of Genuine "D & B" Silent Timing Gears.

L. H. GILMER CO'S PROGRESS

A re-enforced concrete example of the fact that business is better is seen in the new unit which the L. H. Gilmer Company, manufacturers of industrial webbing and belting, is erecting at Tacony, Philadelphia, Pa.

The new warehouse and heating plant is the latest step in a history of consistent expansion which began in a second story room in 1903. It is a fascinating history of faith and courage based on an honest product, but even the faith that moveth mountains and the courage of a lost battalion could hardly have predicted in 1903 the prestige and physical dimensions of the plant of 1923.

Twenty years is only half the productive lifetime of the average man. As long as it is possible in half the productive lifetime of a man to bring a concern from nothing to the present status of the L. H. Gilmer Company, the individual who prates of opportunity being dead must be put down, as a howling pessimist.

Opportunity is dead—for some men. It has always been dead—for the same type of men. But on the door of the other sort Old Man Opportunity is knocking just a little bit more loudly and insistently than ever before, history of this concern indicates.

The L. H. Gilmer Company owns a frontage of 1650 feet on the main line of the Pennsylvania Railroad in Tacony, one of Philadelphia's most important industrial districts. All but 750 feet of this frontage is now occupied by the plant, built up unit by unit, but all of such recent construction as to be uniformly modern. In addition auxiliary plants are operated on Tulip Street, Philadelphia, and at North Wales, Pa.

The new unit will afford 25,000 square feet of warehouse space, equipped with the latest devices for handling freight, and a 6,000 square-foot boiler plant. The boilers are for heating and process work only, as the plant is electrically powered from outside.

Surmounting the re-enforced concrete construction of the building will be a 175 foot brick smokestack, adding another high point to the great industrial spectacle to be seen between Trenton and Wilmington—the spectacle sometimes designated, "Fifty Miles of Smokestacks."

The new building will be connected with the remainder of the plant on the second and third floors by enclosed bridges over the intervening streets, and served by a spur railroad track. It will be completed in March.

BLUE TIP TRANSMISSION LINING FOR FORDS

Blue Tip Lining comes direct from the Libby Factories, where every piece is properly made—not loosely woven together but built from the ground up so to speak—by one maker. There is no divided responsibility for the proper performance of Blue Tip Lining. Each piece that leaves the factory is destined to give its ultimate purchaser the satisfaction pleasure and service he has a right to expect.

The set consists of three lengths of brake lining, each length of a different type best adapted for the work it has to do. The reverse lining is 48 picks, the slow speed is extra heavy and the brake is asbestos. The set is furnished in a carton, complete with the necessary rivets—Price \$2.50 per set. All inquiries should be addressed to Libby Mfg. Co., 111-121 Watchung Ave., Plainfield, N. J.

LAVOTO AUTOMOBILE WASHING SET

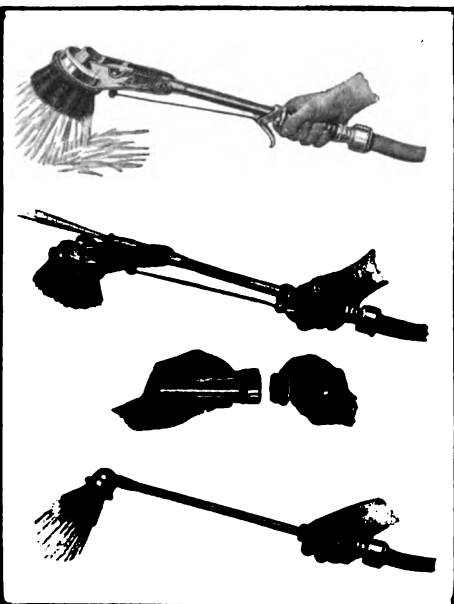
As our readers may see by the illustrations, LAVOTO comes in three parts: "LAVOTO," "LAVOTO JR.," and the "LANCE".

The LAVOTO set is designed by the noted French engineer, Jean J. Cheron, and is made in France. Its purpose is to wash automobiles with a minimum amount of time and labor. The importer of this device describes its use as follows: Screw hose connection into handle of LAVOTO, this larger of the two brushes. Turn on water. The water enters through the handle of LAVOTO, flows through the shaft, and through the brushes which by the way are not hair, but a specially developed china-silk. To begin with the washing, press trigger and by a special arrangement, the brush of the device is forced downward, and the water comes directly out of the end of the shaft in a moderate jet. This jet of water may be directed to all parts of the car, and the body, hood, wheels, etc., may be thoroughly

able of throwing a strong stream of water for fifty feet or more. This may be used to clean out the car and to flush out the floor of the garage, in fact it may be used for any purpose in which a strong stream of water is needed, or where caked mud must be dug out.

It will be noted that this device does away with sponges, pails of water, and all the common adjuncts to washing a car. The hands may be kept clean and dry and the clothes also. No bending or stretching, resulting in backaches. A child may use LAVOTO.

LAVOTO is lightly, yet solidly built of cast aluminum. All parts are easily and quickly replaceable. The entire machine may be taken apart and put together in less than five minutes. A new set of brushes can easily be installed. LAVOTO, the complete set sells for \$12.50. It is being exhibited at the New York Automobile Show by Armin Degener, Inc., its importer, 335 Broadway, New York. Over twenty thousand LAVOTO sets are now in use in Europe, by private owners, garages, taxicab companies, department stores, etc.



NEW MODEL S

The Wheeler-Schebler Carburetor Co., Indianapolis, announces their new Model S Carburetor. This new model is designed to meet the demand for extreme flexibility. It has long range and gives maximum power at open throttle, with maximum economy at part throttle. The air valve and the needle controlling the flow of gasoline are inter-connected. Instead of depending on a greatly increased suction to cause the increased flow of air, the area of the openings is increased when high power is needed, while suction is kept at a minimum. This expanding type of construction enables the Model S to give high power at high speeds and dependable action at low speed as well.

Adjustments are easy. All parts are built large and strong. The fine performance for power economy and easy starting are the outstanding features of the new Model S. The factory has its production schedule ready with deliveries in quantities after February first.

EXTENSION GAP LATHE AND ATTACHMENTS

For many years we have carried in our advertising columns interesting announcements of their line of lathes from the Barnes Drill Co., of Rockford, Ill., who make a specialty of manufacturing extension gap lathes for garage and auto repair shops. This enterprising company has recently added several new and handy attachments. The piston vise attachment holes and centers, for re boring pin holes, all sizes of pistons up to 5 inches diameter. This attachment not only fits the Barnes lathes, but can be used in full plate of any lathe.

The piston cone center and driver is universal for all styles and sizes of pistons up to 5 inches diameter. It has a No. 5 Morse taper shank. Other tapers furnished at extra charge.

The attachments described above will appeal to any auto mechanic. Write for prices direct to the manufacturers and mention this magazine.



Three Years of This Is a *Real Test*

THIS passenger car has been doing tractor duty for three years, hauling 7500 lb. loads of logs on three 40-mile trips every week over all kinds of roads and hills.

The fact that the standard passenger car differential and bevel driven gears in this car have never failed, even under this strenuous service, proves the enormous overload capacity that is at the command of the owner whose car is equipped with Brown-Lipe-Chapin gears.

If replacement of original equipment becomes necessary be sure to protect your investment and insure continuous satisfactory service by insisting upon genuine replacement parts.

Genuine Brown-Lipe-Chapin gears are identified by our trade name on each gear. Replacement gears, when necessary, can be obtained through car dealers or service stations.



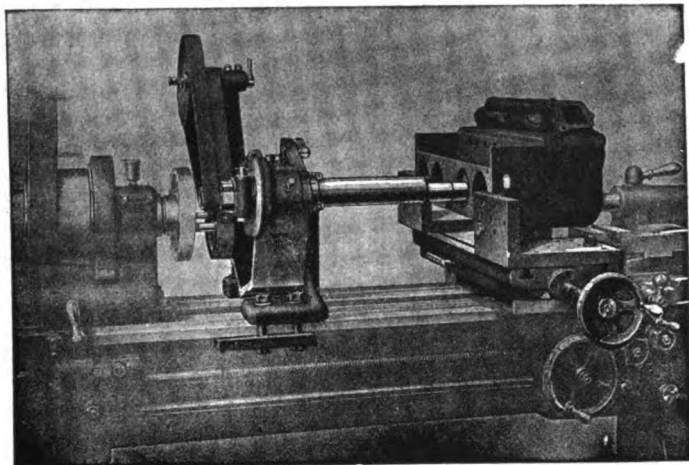
BROWN-LIPE-CHAPIN DIFFERENTIALS

BROWN-LIPE-GEAR TRANSMISSIONS

Both at Syracuse N.Y.

"PLANET"

**AUTOMATIC CYLINDER GRINDER
and BORING ATTACHMENT**



Cylinder Grinding—Crank Shaft Grinding Gear Cutting (Gear Cutter "HELIX")

done on any lathe with our attachments—in your own shop. 3 Minutes to set up or take off. High Precision Work.

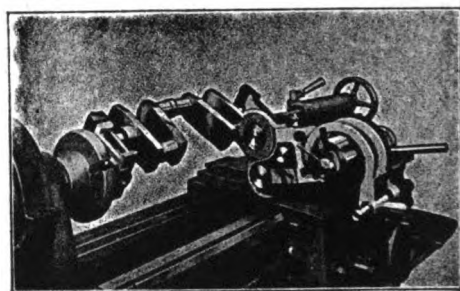
**Ready for Use
Including all Accessories**

Highest efficiency and lowest prices of all similar attachments.

Delivery from stock.

Write for Pamphlets.

— D U P L E X —
**CRANKSHAFT GRINDER AT THE PRICE
OF A CRANK PIN TURNER.**



L. KELLENBERGER AND COMPANY

MACHINE TOOL MAKERS

120 RUTGERS AVE., JERSEY CITY, N. J.

Be-Be-Co
TRADE MARK

Products

*Top Dressing
Nickel Polish
Leather Dressing
Cushion Dressing
Automobile Soap
O-So-Easy Hand Cleanser
Tire Paint
Body Polish*

*If your dealer does not have
them—write today for our
booklet.*

Be Be Co Products

Boston Blacking Co.
Cambridge, Mass.

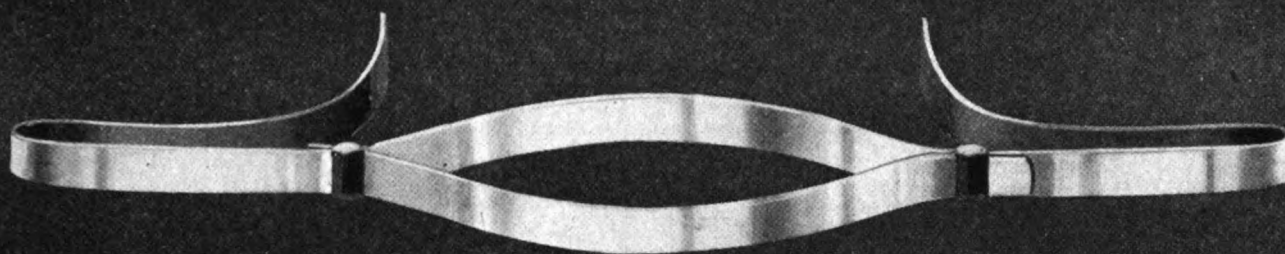
Meet a Wide-Spread Demand

The fellow who works on his own car (you know him) keenly appreciates anything that keeps his machine looking like new.

Because of the efficacy of Be Be Co products in keeping every part of the car right up to perfection you can sell him a whole line of Be Be Co products at good profit.



Please mention the Automobile Dealer and Repairer when writing to advertisers



The New Lyon Vanguard

Here's a whale of a chance for YOU

*The broad-faced Vanguard—at \$16.50 is
in a class by itself for real beauty and sales
possibilities*

THE Lyon Vanguard made its debut at the New York Show. It appeared again at Chicago. And it's a ten-strike from every standpoint—especially sales!

Dealers and car owners alike declared that not another broad-faced bumper near the price could touch it for appearance. And, in addition, it has those sturdy,

staunch bump-absorbing qualities that have made Lyon Resilient Bumpers famous throughout the motor world.

If you have seen the Vanguard, you'll admit it's alone in its class for quick turnover possibilities. If you have *not* seen it, you owe it to your business to look it over immediately. Write your jobber about it—to-day.

METAL STAMPING CO., Long Island City, N. Y.

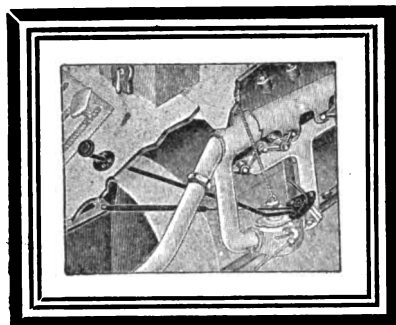
Vanguard Retail
Price **\$16.50**

*Other Lyon Spring
Bumpers
retail at prices ranging
from \$10 to \$25*

JOBBER: *We can make immediate deliveries of the Vanguard. Here's a real chance for a killing.*

LYON RESILIENT BUMPERS

Please mention the Automobile Dealer and Repairer when writing to advertisers



HAVE YOU—

Ever stopped to realize how much easier and safer it would be to drive your Ford Car, if you could control the speed of the motor with your foot and have your hands free to operate the wheel brakes and horn?

The EWALD Foot Accelerator For Fords

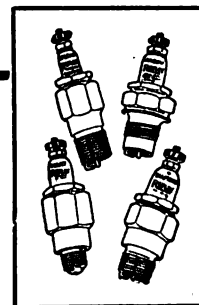
Enables you to regulate the speed of your engine entirely with the foot, which in addition to adding comfort and safety in driving, enables you to make a quick get-a-way in crowded traffic zones and eliminates "Racing" your engine when you slow up. The Ewald is unaffected by road jolts and jars. Get One Now!

Dealers and Jobbers—Write for Sales Proposition

Manufacturers
ROMORT MFG. CO.
Oakfield, Wis.

Price
75c

Sales Department
THE ZINKE CO.
1321 Michigan Ave.
Chicago, Ill.



The
Only
Practical
Way
To Sell

Recommend
A Specific
Type for
Every Motor
Condition

SPARK PLUGS

In recommending the proper spark plug, it is just as essential to know the motor condition as the make of car.

A Specific type of Reflex spark plug is made for each motor condition.

A chart of spark plug recommendations is furnished dealers, which indicates the correct size and type of plug for each motor, according to whether it is a normal motor, a hot motor light duty, a hot motor heavy duty, or an oil pumper. This is the biggest spark plug merchandising plan ever offered the trade.

JUST THE THING

The enclosed end prevents creepage of oil into plug chambers.



FOR OIL PUMPERS

The ball-tipped porcelain construction of the core holds the heat at tip, preventing fouling.

Oil pumpers are the motorists' greatest source of worry. Write for details of this common sense plan, the new Torpedo plug, sales helps, and large profits.

THE REFLEX IGNITION COMPANY
CLEVELAND 3058 West 106th Street OHIO
Since 1909—Spark Plug Makers Supreme



Normal Motor



Hot Motor,
Light Duty



Hot Motor,
Heavy Duty



Oil Pumper

TRADE MARK Red Devil Tools

A Husky Pair of Snips for the Motorist!



"RED DEVIL" Snips are made to cut with the least effort and to stay sharp.

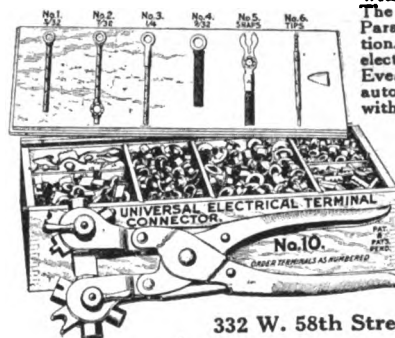
Whenever you have any rough cutting to do—from rubber washers to sheet iron—you have need for this practical snip. It will enable you to do many things for yourself that you would otherwise pay to have done.

At reliable dealers everywhere, or send \$1.00 for a pair. Mention Style No. 578.

Motorist's Tool Booklet
Free

Smith & Hemenway Co., Inc.
Mfrs. of "Red Devil" Tools
83 Coit Street, Irvington, N. J.

New Universal Connector No. 10 NOW—SIX TOOLS IN ONE!!



With 1000 Terminals, 400 Tips. The heads revolve both ways. Parallel movement construction. A tool every battery and electrical station should have. Every type of terminal used in auto and engine wiring put on without solder, including tips for lamp sockets. Wire cutter and insulation gripper assembled on tool.

Price, complete, \$10.00

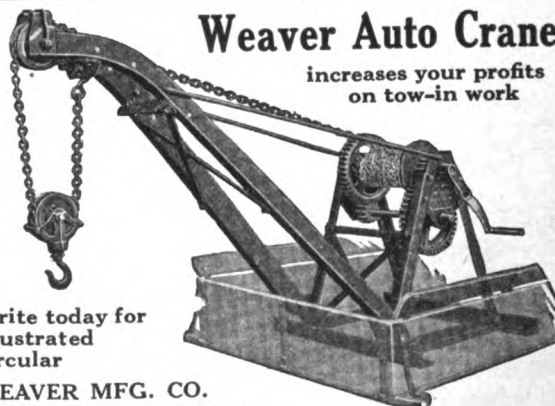
Write today for full information.

Lake-Erb Mfg. Co.

332 W. 58th Street, New York, N. Y.

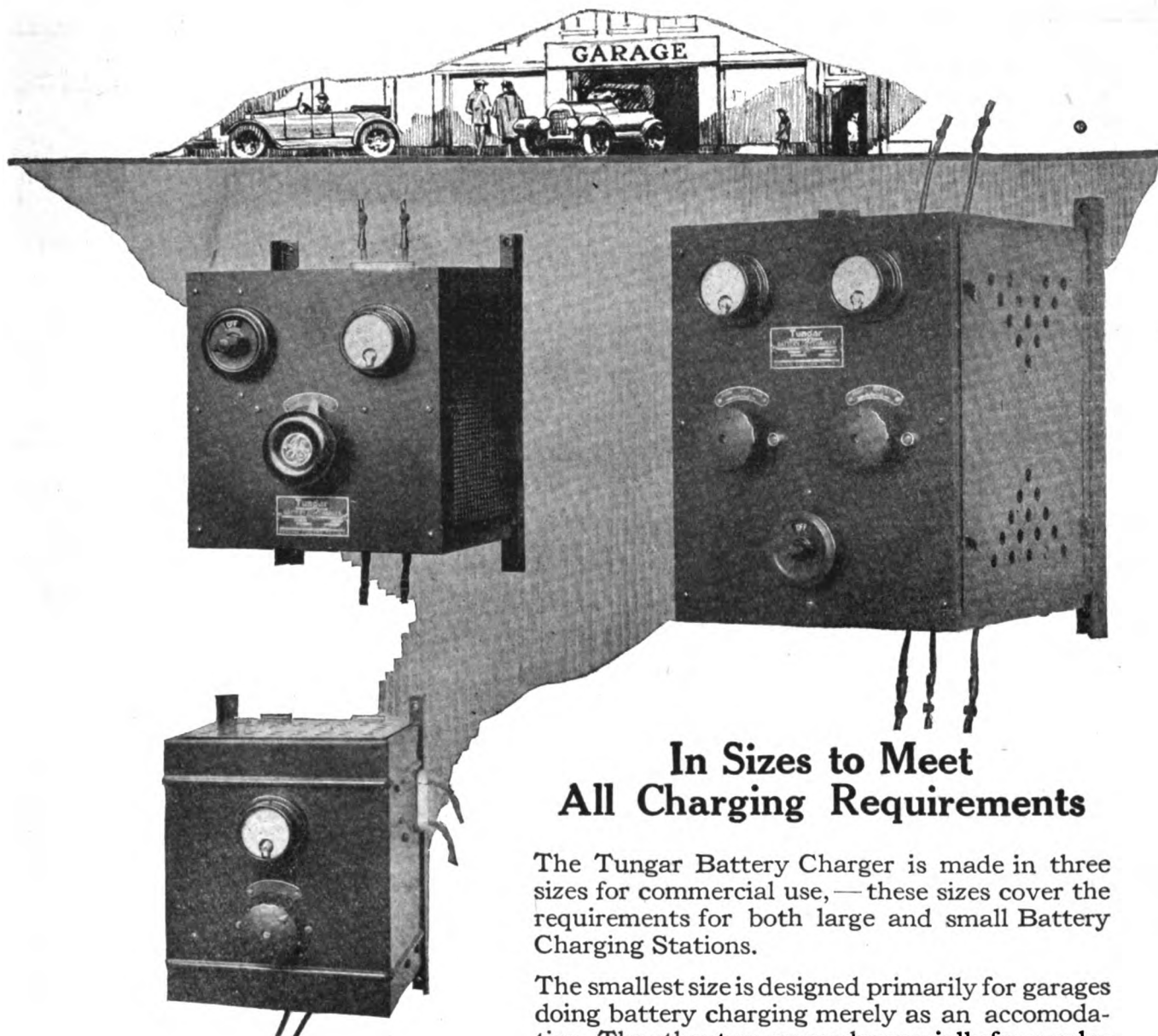
Weaver Auto Crane

increases your profits
on tow-in work



Write today for
illustrated
circular

WEAVER MFG. CO.
Springfield, Ill., U. S. A.



In Sizes to Meet All Charging Requirements

The Tungar Battery Charger is made in three sizes for commercial use, — these sizes cover the requirements for both large and small Battery Charging Stations.

The smallest size is designed primarily for garages doing battery charging merely as an accommodation. The other two are made especially for regular Battery Charging Stations. If the largest capacity is not sufficient, additional Tungars may be installed without loss of efficiency.

The Tungar charges storage batteries from any a-c. circuit. It is simple to operate—turn on the juice, regulate it, and then you are through. There is no danger. The Fire Underwriters have approved it.

And Tungars are the least costly reliable devices of similar capacity—both to buy and to operate. There are over 52,000 satisfied users. Your jobber or our nearest office can give you any further information desired, or address Merchandise Dept., General Electric Company, Bridgeport, Conn.

The 5 ampere 30 volt Tungar charges one to four 6 volt batteries at 5 amperes or less.

The 6 ampere 75 volt Tungar charges one to ten 6 volt batteries at 6 amperes or less.

The 12 ampere 75 volt Tungar charges one to ten 6 volt batteries at 12 amperes or less, or one to twenty 6 volt batteries at 6 amperes or less.

How about stocking one-battery Tungars to sell to users of radio receiving sets?

General Electric Company

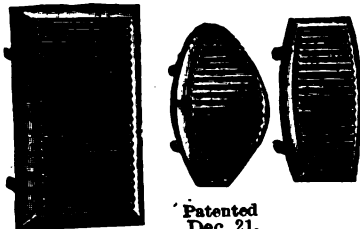
General Office
Schenectady, N.Y.

Sales Offices in
all large cities

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PERFECTION AUTO PEDAL PADS

They insure your foot staying on the pedal no matter how slippery. Big sturdy grips made of high grade, deeply corrugated rubber. Stand by you in the greatest emergency—that's what they are made for.



Patented
Dec. 21,
1915

Any owner can install Perfection Pedal Pads himself in but a few minutes—no bolts—no drilling—simply bend the prongs and they are on for good.

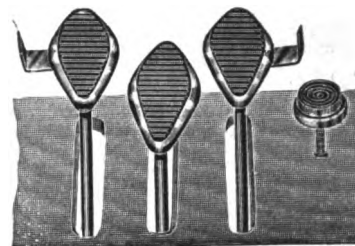
Dealers: Perfection Pedal Pads are big winter sellers. Every dealer handling them is making a turnover. Write for details.

Manufactured only by

The Auto Pedal Pad Co.

318-320 West 52nd Street
NEW YORK CITY, N. Y.

We also make Pedal Pads for all cars on the market. If interested write in for particulars.



PATENT APPLIED FOR

SEE THE

NEW D HOOK PADS

For Ford Cars—Absolutely prevent the foot slipping off the pedal.
"PERFECTION" Pedal Pads—Better Than Ever.



Secret of Its Triumph in New Locking Device

A windshield cleaner that is winning wide favor because it embodies all the features of a good cleaner—plus a new locking device that makes for quick responsiveness, a firm, effective stroke, and long service.

MALCO Universal Windshield Cleaner

Because it can be clamped on or bolted through hole of windshield frame of any make or model of car, dealers are finding it profitable to standardize on MALCO. It reduces capital tied up in stocks and results in quick turnover.

Ask your jobber's salesman about the Malco line of products or write us direct, sending name of your Jobber.

Malco Products Corporation

220-224 W. So. Temple, Salt Lake City



Are You Just Pretending?

After your day's work is completed and you cast off your jumper suit for a white collar and mingle with your customers at the theatre, the club, or wherever you might meet them—as man to man—can you conscientiously feel that you have served them to the utmost of your ability?

Remember, the doctor, the lawyer and the merchant know very little about that seemingly complicated motor under the hood, they leave it to you to keep it in faultless condition. Are you doing it? We have some very interesting data to send you. Follow that impulse, write or wire us today.

UNIVERSALLY SUPREME!

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MOST PERFECTED PISTON RINGS



KENDELL ENGINEERING CORPORATION
FORT WAYNE INDIANA

When You Buy From Us,
You Deal With Headquarters!

LAMP SERVICE FOR THE MOTOR CAR

LAMPS and PARTS of every conceivable type—in stock—ready to ship!



VARIETY—PRICE—DESPATCH

Head Lamps Cowl, Dash, Pillar, Side, Dome, Step Corner Search and Spot Lights—in Gas, Oil or Electric—in a profusion that overlooks nothing.

SUPERIOR LAMP MFG. CO., Inc.

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Branch:
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Newark N. J.

"In Business Since 1902"



The Best and Most Economical Tire Re- pair Equipment

—for any tire repair shop

We make a complete line of Vulcanizing Equipment. Also a full line of Tools, etc. Write for Descriptive Catalog and Prices.

The Akron Rubber Mold Machine Co.
917 Switzer Avenue AKRON, O.

AKRON-RUBBERMOLD

TIRE REPAIR EQUIPMENT

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Style "S" Single-Stage
Outfit

Belted only—five sizes, 1-4 to
3 h. p. complete, less driving
power.



Style "V" Two-Stage
Outfit

Sizes 3-4 to 2 h.p. Furnished
with automatic starter. A.C.
or D.C. motor.

"An Original Design"

YOU can purchase a Curtis Outfit with all the confidence that goes with a well known, thoroughly established and reliable product. Sixty-nine years of experience, over twenty-six of which have been devoted to the manufacture of air compressors, have enabled Curtis engineers to develop an entirely original design based on sound engineering principles.

First and Only Two-Stage Air Compressor With a Copper Intercooler

Curtis Single-Stage Compressors have controlled splash oiling system—no excess oil to rot tubes. Big saving in oil. Fan flywheel aids in keeping cylinder cool; increases capacity. Hand unloader prevents blowing fuses and jumping belt, and many other exclusive features. Several styles and sizes.

Curtis Two-Stage Compressors have all features of the single stage. Exclusive aeroplane-type copper inter-cooler assures fullest advantage of two-stage compression. They are perfectly balanced so that the crankshaft bears a uniform load—this assures less vibration and wear. Several styles, and capacities. For full information use coupon, or a postal.

Curtis Pneumatic Machinery Co.
1530 Kienlen Avenue, St. Louis, Mo.

Branch Office: 530-E Hudson Terminal
New York City

Canadian Representatives: Joseph St. Mars,
Winnipeg and Toronto Canada,

CURTIS *Single and
Two Stage*
Air Compressors

1530

Send
Coupon

Curtis
Pneumatic
Machinery Co.

Gentlemen:
Please send me descriptive
folder and full particulars
on Curtis Air Compressors.

Name.....

Address.....

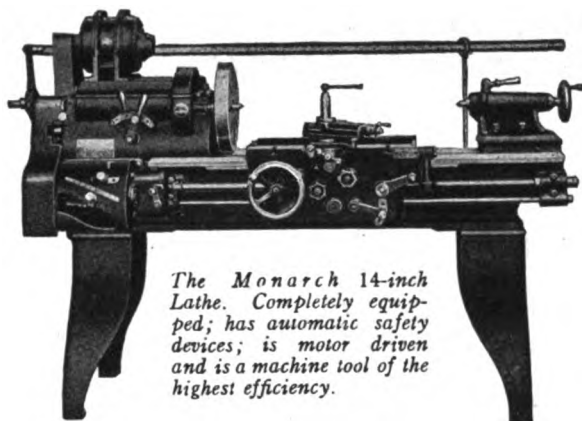
Jobber's Name.....

Address.....

Whether Large or Small Every Garage Should Have at Least One MONARCH Lathe

To convince yourself of the profits other lathe owners have been making on the work you send them—get your bills for this work for the past month. Divide the total with the number of working days. **THE PER DAY AVERAGE WILL SURPRISE YOU.**

No doubt there were numerous other jobs, in addition to this lathe work, that could have been finished more quickly if you had a **MONARCH Lathe** in your own shop.



*The Monarch 14-inch
Lathe. Completely equip-
ped; has automatic safety
devices; is motor driven
and is a machine tool of the
highest efficiency.*

Send for Our Special GARAGE Catalogue

Write us—tell us about your business. We'll gladly help you select a lathe that will answer your purpose. Let us send you letters we have had from lathe owners telling about the profits they have made since beginning to do their own lathe work.

THE MONARCH MACHINE TOOL COMPANY
202 Oak Street **Sidney, Ohio**

Motor Mechanics' Prize Contest!

Each month this magazine will award a prize for the best articles received during the preceding month on any of the subjects listed below.

If you have done any repair work on automobiles, either as an amateur or a professional repair-man or mechanic, we are sure you could send in something interesting and instructive.

You do not need to be literary, or book learned to be successful. We have editors who will put your stuff into magazine English. We only want the practical ideas. Send a rough diagram or drawing if possible so we can illustrate your article. Our artist can produce a finished sketch if you will merely indicate your mechanical ideas by a pencil sketch or photo. The prizes offered are as follows:

FIRST GROUP

ENGINE REPAIRS

First Prize	\$5. cash
Second Prize	3. cash
Third Prize	2. cash

THIRD GROUP

TIRE & TUBE REPAIRS

First Prize	\$5. cash
Second Prize	3. cash
Third Prize	2. cash

SECOND GROUP

ELECTRICAL REPAIRS

First Prize	\$5. cash
Second Prize	3. cash
Third Prize	2. cash

FOURTH GROUP

SPECIAL OR HOME MADE TOOLS

First Prize	\$5. cash
Second Prize	3. cash
Third Prize	2. cash

Articles Limited in Length to 1,000 Words

Manuscripts of contestants whose articles do not win one of the prizes, but which are desirable for publication, will be paid for at our regular space rates to contributors.

New Closing Date—March 31st
SEND IN YOUR ARTICLES—NOW

We have several requests that our closing date for this contest be advanced, as the time allowed for receipt of entries is very short during a monthly contest. We are therefore announcing that this contest will not close until March 31st, 1923. We hope this meets with the approval of all our readers and that many more will now find time to submit manuscripts.

Do not hold back. Help to make our magazine more interesting by joining in this interchange of workshop experience.

You can send in as many manuscripts as you choose, but no contestant, will be entitled to more than one prize in any group.

Address all manuscripts or inquiries regarding the Prize Contest to

Prize Contest Editor

Automobile Dealer and Repairer

16 Hudson Street,

New York City



Power King Drill in use in Garage of General Electric Co. Schenectady, N. Y.



Power King

Portable Electric Drills

**“—for the efficiently
managed garage”**

POWER KING is a portable electric drill of tremendous power. It will cut through anything that a stationary type of drill will, —and you take the drill to the work on a lead wire, just as you do a lamp.

POWER KING drills wood, too—or any other material. And it drills holes where you want them—in chassis frame, engine, pan—wherever repairs call for holes. For example, it is just the tool for drilling out broken studs. It has two speeds, and its uses in any garage are innumerable.

POWER KING is rugged in construction. Recently one of these tools—put to the test—ran 106 CONTINUOUS hours, under full load, WITHOUT SHOWING ANY APPRECIABLE RISE IN TEMPERATURE. We mention this to show you, rugged though POWER KING is, how finely it is adjusted.

One thing more. POWER KING IS SOLD ON EASY TERMS. Ask your jobber, first, and then, if he won't supply you, write to us.



Send for this bulletin
on POWER KING

A-100-F

Jones, Mac Neal & Camp

INCORPORATED

FACTORY & GENERAL OFFICES
WARSAW, INDIANA.

Please mention the Automobile Dealer and Repairer when writing to advertisers

THE GREATEST

AUTO REPAIR BOOK IN THE WORLD!

Just Out

THE NEW

13th Edition

DYKE'S AUTOMOBILE

And Gasoline Engine

ENCYCLOPEDIA

1238 Pages

Entirely Rewritten, Rearranged, Illustrated and Enlarged

4143

(Mr. Dyke has devoted almost two years' time on rewriting and illustrating this new edition) **Illustrations**

A Practical Book on the Automobile for Everybody

The Repairman will find this book a ready reference and guide for any repair—mechanical or electrical. (14,000 lines of Index.)

The Auto Owner will know how to diagnose troubles, and know when repairs are done right.

The Student first learns the fundamental principles which are most important for the beginner and the key to a successful repair man.

This Book Teaches the Fundamental Principles of each and every part of an automobile—mechanical and electrical—in a simplified manner—once the fundamental principles are learned—then it is easy to diagnose any trouble.



This Book Will Teach You to Become an Expert Automobile Repairman, not only on testing, adjusting and repairing engines, carburetors, clutches, rear axles, differentials, tires, etc., but an Electrical Expert on ignition, generators, starting motors, storage batteries, etc.

You Will Understand the fundamental principles of clutches, transmissions, rear axles, engines, carburetion, ignition, generators, starting motors, storage batteries, etc. After the fundamental principles are learned, the variance of construction of parts will be clearly understood and you will be able to diagnose trouble quickly and test every part of a car, truck or tractor.

Facts About This Remarkable Book

The United Y. M. C. A. Schools have adopted this book as their standard text and reference book.

Leading Automobile Schools in the U. S., Canada, New Zealand and Australia are using this book.

During the war this book was used extensively by our Government and sanctioned for use in Schools of Military Aeronautics in England.

This book has a larger sale than all other automobile books combined.

Prior editions of this book had 960 pages and 3,362 illustrations. This new edition has 1,238 pages and 4,143 illustrations. It contains over 14,000 lines of index, and the price is the same.

Price, Cloth Bound, \$6.46 Prepaid.

Address all orders to

MOTOR VEHICLE PUBLISHING CO., 16-22 Hudson St., New York City

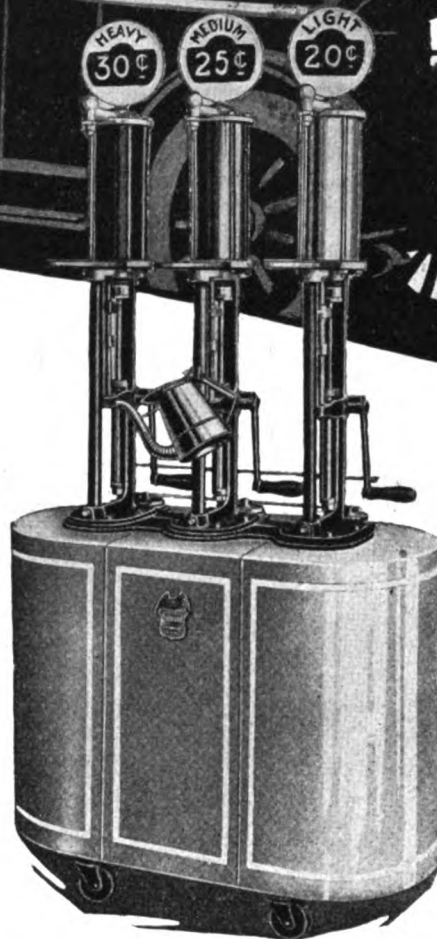
Several Books in One

This book contains the latest information on Repairing, Electrical Systems, Ignition, Carburetion, Storage Batteries, Tire Repairing, etc. Separate books on these subjects would cost many times the price of Dyke's.



A QUESTION *this* DEALER is *proud* TO ASK

Because he is equipped to give *quick* service—
Because his three grades of oil are *visible*, in *clean* containers, and conveniently located—
Because he can *show* and *recommend* the grade of oil best suited to the motorist's needs—
Because he wants the motorist to know he is *progressive*, anxious to please and watchful of his customers' interests.



American Visible Lubricating Outfit

Oil pays the dealer a *substantial* profit. The average dealer's oil service is not only unattractive—it's unclean, unsanitary and very inconvenient. That's why he sells so little.

Make that service attractive and you will get the *big volume* of business in your territory.

The motorist takes the same pride in his car that the horse racer takes in his prize winner. And, like the horseman, he wants it fed with *clean* material in a *cleanly* manner.

The American Lubricating Outfit serves *clean* oil. It serves it *quickly* even in cold weather because the pump *forces* the oil into the measure. There is absolutely no dripping from the spout—no waiting for

gravity flow.

Under the spouts is room for half gallon measure. The gauge stick furnished is so carefully graduated in quarts it serves as meter for checking off sales.

The outfit is mounted on casters—easily rolled in and out of the garage—holds three grades of oil, and placed alongside an American Visible Gas Pump will give you a combination on which you will realize *pride, profit, and much increased trade*.

The only successful way to meet competition is to give a *square deal*, and *quick, clean service* with the *best* and *most reliable* equipment—the American Visible Gas Pump and the Lubricating Outfit.

Write *today* for prices and information.

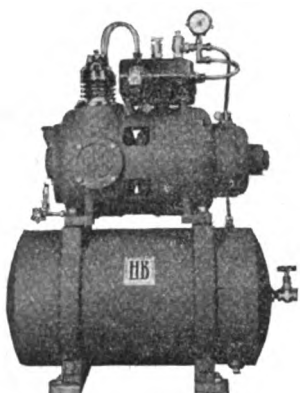
The American Oil Pump & Tank Company

1143 FINDLAY STREET

CINCINNATI, OHIO.

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\$35 Brings Your Shop **GUARANTEED**
FREE AIR SERVICE
With HB Automatic Twin Compressor

Increased profits and new business gained by your improved service easily pay balance on small monthly terms.

Good free air service Day and Night is your shop's biggest and best-paying advertisement. Pulls trade, brings new customers, helps you sell tires, oil, gas and accessories. Get an HB Twin Automatic Air Outfit installed now. It will be your most effective business builder.

Extremely compact construction enables you to use the HB Compressor in limited space. This HB Air Compressor is the QUIETEST OPERATING outfit on the market. Can be placed in office or salesroom. Entirely automatic in operation. Maintains 120-140 pounds or higher if desired on air lines 24 hours per day. Four cubic feet capacity. Saves current due to compact single unit construction. Noisy, breaking belts eliminated. Fully equipped, ready to connect up and operate. Comes to you on easy terms. Satisfaction assured under our money-back guarantee. Write or wire for Bulletin K-39.

HOBART BROS.,

Successful Manufacturers since 1893,

Box D2, Troy, O.

Absolute Satisfaction Guaranteed or Money Back

PORTABLE FLOOR CRANE AND HOIST

We recommend this low base Crane No. 3 where necessary to run under low places—particularly for Garage work. The "Canton" is a semi-steel Crane—furnished with guaranteed hand-forged tested chain—high quality drop forgings.

*It's Built in the Strongest Manner
and is Practically Everlasting*

You can't wear it out. It's fully guaranteed. A trial in your shop will soon convince you that a better Hoist could not be built at any price. Write for catalog and full information—today—don't put it off.



The Canton Foundry & Mch. Co.
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*Send in Your Name for This
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96 Pages—Every Month

HELPS you to equip, maintain and manage garage and build up profitable auto goods trade, by keeping you in constant touch with the latest buying opportunities in auto materials, tools, parts and accessories.

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PRACTICAL PULLING TOOLS

—That Fill An Every Day Need

The "Little Giant" and the "Big Buster" cover a range of work which is not approached by any other combination of pulling tools on the market. These tools cannot spread, turn or slip off the work—no arm locks required. "THE HARDER THE PULL—THE TIGHTER THE GRIP." A principle quickly understood and appreciated by mechanics who have had experience with ordinary pullers.

REPLACES OTHER TOOLS

Every garage, service station and auto-repair shop have an actual need for both the "Little Giant" for all ordinary jobs, and "Big Buster" to handle the heavy work.

They will be a desirable and profitable addition to your tool stock.

Order From Your Jobber
PREMIER ELECTRIC COMPANY
Manufacturers—Est. 1905

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"Phew! I've walloped that bird with everything but the shop window and he's looking for more! Tough? I'll say he is!!! And he'd oughta make one tight joint!"

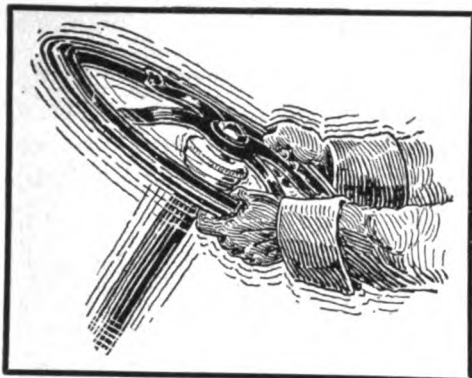
"When you're tested, boss see how easy I cut with a knife!"

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For all Oil, Gasoline and Water Connections
SOLD THROUGH JOBBERS - M't'd by Fibre Finishing Co., Boston, Mass.

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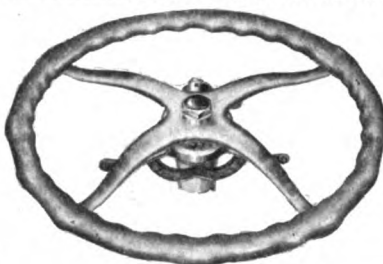
Cheaper Insurance!

Insurance Companies allow a 15% reduction in theft insurance on cars equipped with a STEER-AT-EZE-LOCK

STEER-AT-EZE-LOCK

FOR FORD CARS

DOES IT—



PUTS A POSITIVE STOP

To the fatiguing, nerve racking road jolts, jars and vibrations transmitted to the steering wheel thru the steering column.

INSTALL ONE NOW

Furnished complete with [high grade aluminum spider steering wheel.

Price, Steer-At-Eze-Lock with wheel.....\$13.50 (West of Rockies \$15.00)

Steer-At-Eze-Lock, without wheel..... 8.50

Steering Control only without lock or wheel. 3.50

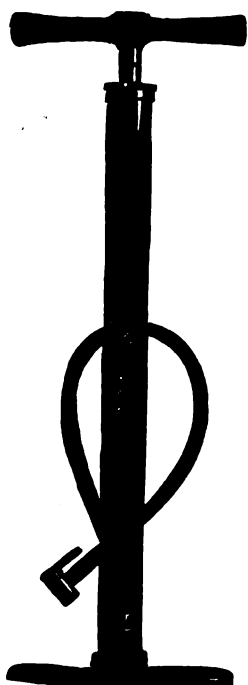
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ROMORT MFG. CO.
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Write our sales department
today for full details

Sales Dept.
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1321 Michigan Ave.
Chicago, Illinois



THE "JAMES" TIRE PUMP



The most important thing to know about a pump is—does it pump easily? Next, is it strong and solidly built? Next, is it always ready for instant use?

The "James" Tire Pump meets the demand for a strong and durable single action pump and is superior to the compound two and three cylinder types, for less energy is required to inflate tire.

Extra heavy material and special fittings such as seamless steel tube, solid brass fittings, five-ply hose, patented hose connection, extra large wooden handle, strong steel piston rod, finest cup leather, and heavy malleable iron foot base.

Patented positive Check Valve, the design of which is so simple that the same can be re-ground and replaced in perfect condition by any amateur.

The finish of this Tire Pump comprises the steel barrel, malleable iron base and wooden handle, beautifully done in bright black enamel and the brass fittings highly polished.

Write for complete important details

GENERATOR VALVE CO.

Manufacturers

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INVESTIGATE LATEST "WHITNEY" HIGH EFFICIENCY ROLLER AND SILENT TYPE CHAINS

also Low Cost per Thousand Miles of Service



LATEST ROLLER CHAINS HAVE SPECIAL QUALITY SOLID ROLLS AND OTHER IMPORTANT IMPROVEMENTS

Front End Motor Chain Drives



EXCEPTIONAL MILEAGE AND NEVER KNOWN TO SKIP THE SPROCKET TEETH

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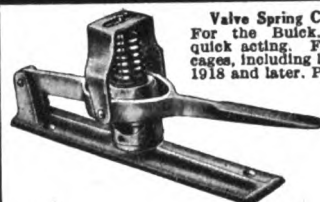
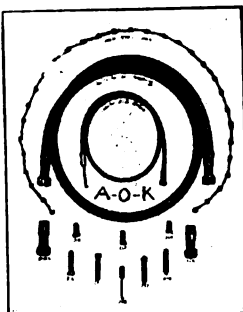
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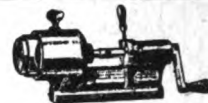


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Valve Spring Compressor
For the Buick. Powerful,
quick acting. For all valve
cages, including large ones of
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"Minute" Valve Grinder
For Buick.
Price, with steel, \$8.25



Rocker Arm Lever
A simple matter to tilt
Buick rocker arms with this
convenient tool. Price \$0.50

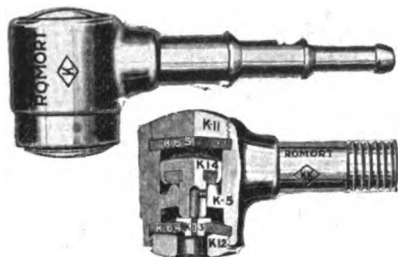


Valve Cage Remover
Easily removes Buick
valve cages without
damage. Price \$1.00

Valve-Grinding Set,
for Buick, consisting
of Rocker Arm Lever,
Valve Cage Remover,
Valve Spring Com-
pressor and "Min-
ute" Valve Grinder.
Price \$12.50

Write for Catalog of Newton Indispensable Tools and
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A Sensation!



Explains in a nutshell the reception of the new "K" and
"KK" Romort Automatic Air Valves by garagemen
everywhere who maintain a tire air service.

"K" and "KK"

Romort Automatic Air Valves

In these new valves the necessity of frequent rubber
washer replacements is practically eliminated. They are
operated entirely by air pressure without the aid of
springs—"K" and "KK" valves are so designed that they
are readily adaptable to wire, disk and truck wheels, a
feature readily appreciated by all.

Made with the same high degree of workmanship and ma-
terial that has marked Romort Valves "The Best That
Money Can Buy."

Ask Your Jobber

Manufacture
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Jobbers
Write our
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Sales Department
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1321 Michigan Ave
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ELECTRIC LIGHT or TALLOW CANDLE

Which Would You Prefer?

There is just as much difference between
ordinary plugs and

THE WHITE FLAME PLUG



guaranteed absolutely to give
a fat, white, hot, thick spark.
four times hotter and fatter
than any other spark plug on
earth. Get this clearly—it
gives a white flame instead
of a red spark on any system
of ignition, on any automo-
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Its fame has penetrated to
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Dealers may have exclusive
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biggest and quickest seller
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DURO PLATES

FOR BATTERY BUILDERS

To meet the demand of battery stations who are called upon to
build up starter batteries the "Duro" line of plates have been
developed. "Duro" plates are made with the same high grade
materials and workmanship as used in "Titan" plates. Tonnage
production enables us to quote attractive prices.

GENERAL LEAD BATTERIES COMPANY
Chapel Street and Lister Avenue, Newark, N. J.



No. 20 HANDY GARAGE SHEAR

An everyday necessity in any accessory
store, garage or repair shop. Handiest
bench shear for cutting brake
lining, gaskets, sheet metal, etc.

Sold by Jobbers

Ask us for descriptive circular
and name of jobber
near you carrying
same in stock.

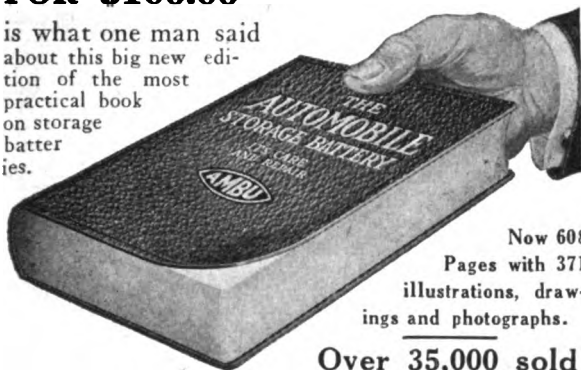
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WOULD NOT BE WITHOUT IT FOR \$100.00

is what one man said about this big new edition of the most practical book on storage batteries.



Now 608
Pages with 371
illustrations, drawings and photographs.

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A Practical Book on Storage Batteries. Gives in non-technical language the working principles, construction, operation, manufacture, maintenance and repair of lead-acid batteries, used on automobiles, farm lighting and radio equipment. Describes, at length, all subjects which will help any man build up a successful battery repair business.

There are countless suggestions and ideas on such subjects as the manufacture of batteries, battery charging, lead burning, testing and examination of incoming batteries, battery overhauling, and battery shop business methods. Gives numerous short-cuts, and supplies information that may be worth hundreds, perhaps thousands of dollars, to a man in a year's time. It is 608 Pages of ready-to-use valuable information. Printed in the best quality enameled stock which brings the 371 illustrations out in exact detail. Price delivered only \$5.00.

Order From Your Jobber or Send Coupon Below.

American Bureau of Engineering, Inc. 2624 Prairie Ave., Chicago, Ill.
Send No Money—Just Mail This Coupon Today



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Date.....

Please send your big new edition of "The Automobile Storage Battery" book. I will deposit with postman \$5.00 on delivery—and if I decide within five days not to keep it, my money will be refunded.

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THE GREAT DIFFERENCE



No other pump has an all metal—positive seating—check valve. This is an exclusive Anthony feature.

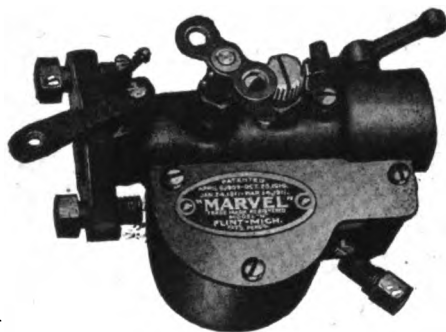
There is enough air in a 27 inch hose to half fill the cylinder of a pump with a leaky valve.

No wonder the owner of an ordinary pump pumps, pumps, and pumps.

EXAMINE
it and you will
BUY IT

THE ANTHONY COMPANY
LONG ISLAND CITY NEW YORK

FORD SPECIAL



MODEL "N" \$10.00 f. o. b. Factory

Review in your mind the important part carburetion plays in your motoring experience.

Isn't it more satisfying to have a carburetor that can be depended on to function under all conditions?

Marvel performance, economy and durability is an established fact, backed by the judgment of some of the largest automobile manufacturers.

MARVEL CARBURETER CO.
FLINT, MICH.

SAVE TIME AND MONEY

Keep your drills in MORSE INDEX CASES

The size wanted is always available, and you can take out but one drill at a time. No regauging necessary.

The drills are contained in holes arranged in concentric circles in the block. The swinging cover can be moved so that its holes will register with the holes in the outer cover or cap. Around the edge of the cover are stamped the sizes of the various drills. The cap is turned to bring any size in line with an index mark and by inverting the case the selected drill will drop out.

These cases are made up to hold the following Sets of Straight Shank drills.

☆ to 1/4" x 64ths

☆ to 1/2" x 32nds

60 to 3/8 inch

Nos. 1 to 60

1/2 Set alternate

Nos. 1 to 59

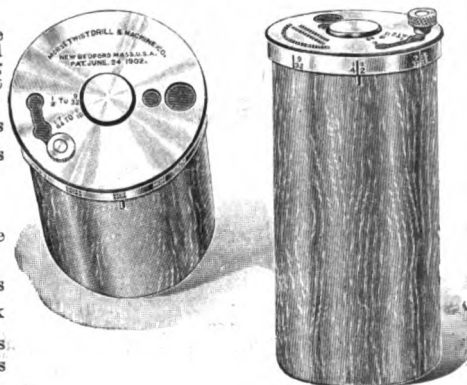
1/2 to 1/2" x 32nds

and Bit Stock

Drills

☆ to 1/4" x 32nds

☆ to 3/8" x 16ths



MORSE
TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASS. U.S.A.

FELTBAK for Fords

—the correct brake lining



Feltbak Holds Corks in Place

In Feltbak the corks are positively, securely held in place. They can't come out. The wonderful friction value of cork-in-fabric brake lining is well known. Add to this the felt cushion backing and the automatic lubrication to prevent burning and you have the *correct brake lining for Fords* —FELTBAK.

Use the *correct brake lining* in your Ford and stop that car-killing, nerve-racking vibration. Feltbak lasts so long that it is far the cheapest —and it actually prolongs the life of your Ford car.

Ask your dealer for Feltbak. He has it or can get it from any wholesale house

ADVANCE AUTOMOBILE ACCESSORIES CORPORATION
Dept. 1158 1721 Prairie Avenue, Chicago

FELTBAK has a cushion of felt between the band and lining—the new and correct principle in Ford brake lining. Joined with this new principle is the tried and proved idea of cork for friction—with 21 oil holes in each band for lubrication to prevent burning.

Lubricates Itself Softens Brake Action

The felt backing absorbs and holds oil like a wick. When pressure is applied, oil spouts through the oil holes on to the surface of lining. More pressure forces out more oil. Thus the braking surface gets oil during braking action—right when needed to prevent burning or glazing. Hard, glazed brake lining is what causes the chattering vibration in Fords.

The felt cushion backing equalizes and softens the contact of the lining with the drum —smooths the braking action — gives you perfect control of your car.

<p>WHITE STRIPE FAN BELT FOR FORDS and LARGER CARS</p> <p>Outwears Six Ordinary Belts on Ford Cars Never needs adjustment. For larger cars, too.</p>	<p>ADVANCE ASBESTOS BRAKE LINING for LARGER CARS</p> <p>Made from genuine asbestos for use on larger cars. Buy it for Better Brakes and Longer Wear.</p>	<p>DUPLIX SHOCK ABSORBERS FOR FORDS</p> <p>The Shock Absorber for Rough Roads. Eliminates bounce, side-sway, vibration. You wouldn't believe a Ford could ride so easy.</p>	<p>RED STAR TIMER FOR FORDS TRUCKS and TRACTORS</p> <p>The scientifically correct timer for Fords; Roller of 100 pt. carbon tool steel; torsion spring type rotor assembly.</p>	<p>WHITE STRIPE TRANSMISSION LINING FOR FORDS</p> <p>— Means Better Ford Brakes Less up-keep expense Woven and treated especially for Fords</p>
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"Every Product the Best of its Kind"

Please mention the Automobile Dealer and Repairer when writing to advertisers

Get a Good Start for Spring Trade



NOW

*is the time to advertise
in the*

**Automobile Dealer
and Repairer**

*Our Extra Circulation
To important Trade lists
is trade stimulating*

**Automobile Dealer
and Repairer**

**16-22 Hudson St.
New York City**

THIS ISSUE OF THE **Automobile Dealer and Repairer**

and also the issues of March, April and May

will be sent not only to our regular list of subscribers, but to the ENTIRE LIST OF WHOLESALE DEALERS and JOBBERS in automobile accessories throughout the United States and Canada.

These Issues will also be mailed to the ENTIRE LIST of public garage owners, repair shop proprietors and RETAIL ACCESSORY DEALERS in the United States who are rated in Dun's Book at \$50,000 or over.

This will be your great opportunity of the year to cover the most desirable buyers that could possibly be reached.

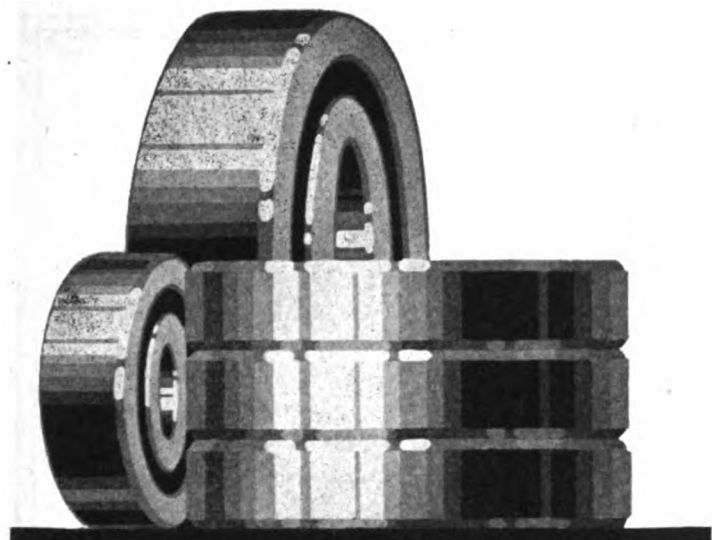
Business to be obtained for the manufacturer in the months of March, April and May means more in volume than probably all the other months of the year.

Send in Your Advertising Copy Today !!

ADVERTISING DEPARTMENT

MOTOR VEHICLE PUBLISHING CO.

16-22 Hudson Street, New York City



AHLBERG GROUND BEARINGS

Reduce the cost of keeping cars on the road by turning in your old Bearings for AHLBERG GROUND BEARINGS.

They cost less than new Bearings, yet do not sacrifice any of the efficiency of new Bearings.

AHLBERG BEARING COMPANY

321 East 29th St. Chicago



Magic Rubber Mend

Makes
Permanent
Repairs

All reputable
Makers of Auto-
mobile Tires build
them to make
their guaranteed
distance.



Automobile owners defeat the Maker's purpose by neglect.

A Blowout is usually the fault of the owner. Why?

Because he allows cuts in his tires to go unrepaired. Water, acids, sand and dirt does the trick to the fabric.

It rots, weakens, bursts.

Magic Rubber Mend fills up these tears, rips, cuts, and protects the fabric or cord from decay—

Vulcanizing is often unsatisfactory and too expensive.

Magic Rubber Mend does it properly, and permanently at one twentieth the cost of vulcanizing.

Dealers and Garages write for special prices. Must be right or money back.

Eastern Rubber Company
Philadelphia, Pa.

This Paper is a "Member of the A.B.P."

To you, this is a fact of especial significance, for it means that this publication is part of a concerted movement to raise the level of publishing practice, to assure better service to both subscribers and advertisers.

The "A.B.P." is built upon and revolves around the following set of standards—

STANDARDS of PRACTICE

THE publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself—

1. To consider, first, the interests of the subscriber.
2. To subscribe to and work for truth and honesty in all departments.
3. To eliminate, in so far as possible, his personal opinions from his news columns, but to be a leader of thought in his editorial columns, and to make his criticisms constructive.
4. To refuse to publish "puffs," free reading notices or paid "write-ups"; to keep his reading columns independent of advertising considerations, and to measure all news by this standard: "Is it real news?"
5. To decline any advertisement which has a tendency to mislead or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation statements, subject to proper and authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

Publications which have subscribed to these standards have earned the preferred consideration accorded them.

**THE ASSOCIATED
BUSINESS PAPERS, Inc.**
220 West 42nd St., New York

One Minute, Please

Of course you advertise in some way. Don't try to tell me that your business is different, that other men can make advertising pay in their business, but not you. I have already met too many of these business men whose business is "different."

If you have anything to sell, whether professional services or merchandise, or just talk, you can advertise it. I wouldn't advise an undertaker to advertise embalming fluid in a theatre program, but an undertaker can advertise profitably just the same. Not long ago I saw the advertisement of one such on a board fence where a highway crossed two railroads at grade. That man isn't waiting for opportunity to come to him. He is going to meet it.

If the advertising in the United States for the past three years had been doubled instead of being cut down, do you suppose we would have slumped in business as we did? Not much.

If you want people to come in to do business with you, you need to keep asking them to come. Keep telling them what you can do for them until they believe it.

Why do the mail order houses get so much trade? Not because they offer great advantages to the consumer. It is almost always more convenient, not to say more satisfactory, to buy from the local merchant. Business goes to the catalog houses because they ask for it and keep asking. They advertise.

You should advertise—more.

Frank Farrington.

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SUSPICIOUS

"I'm afraid I must have made a mistake and given that waiter a larger tip than I intended to."

"What makes you think so?"

"He said 'Thank you.'"

Spring clips will loosen if the nuts on the clips are not kept tight.

Classified

Advertisements

Classified

Advertisements

Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange at the uniform price of seven cents a word, including the name and address, for each insertion, payable in advance.

No advertisement will be inserted for less than one dollar, however small.

Remittances may be made in postage stamps or in any convenient way.

Special rate of 40 cents per nonpareil line for each insertion if taken for 12 consecutive times.

Address MOTOR VEHICLE PUBLISHING CO., 16 to 22 Hudson Street, New York

Ford Starters

SIMPLEX STARTER FOR FORD \$20. Guarantee. Easily installed. Simple, Durable, Satisfy. Secure agency in your territory. Big profit selling them. American Simplex Co., Anderson, Indiana.

Opportunities

Weezy-Squeaky-Springs soon break. Compton Spring Oilers prevent breakage by automatically lubricating spring leaves making smooth riding. Quickly attached without drilling or changing parts. Send \$4.00 complete set eight oilers; Special Ford Set \$2.00. Country agents and wholesale distributors wanted. Box 14, Compton Company, 29 Broadway, New York.

Long established manufacturer of auto accessories which are daily sold by practically all wholesale and retail accessory houses will consider manufacturing and distributing new automobile products capable of equally wide sale through same channels. Patented articles preferred. Address: "Auto Accessory Manufacturer," 1400 North American Bldg., Chicago, Ill.

Rebuilt & New

"Rebuilt and new electric motors, generators and transformers, all standard makes, sold, bought and exchanged. Our rebuilt motors stand every test of new motors; 8000 always in stock; send for stock list. Write what you want or have to sell." Fuerst-Friedman Co., Cleveland, Ohio.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice of four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

PEP OFFERS A NEW BEARING GRINDING COMPOUND

The Pep Mfg. Co. Inc., maker of the water-mixed valve grinding Pep, recently placed a new bearing grinding compound on the market.

This new compound is the result of months of exhaustive research and experiment conducted in an attempt to produce an ideal bearing grinding compound that would be a radical improvement over all others.

The results were most gratifying.

The new compound may be mixed with either oil or water, is absolutely safe and does a smooth job at greatly increased speed, while owing to large quantity production the Pep "Safety First" Bearing Grinding Compound sells for one-half the price of all others. Price, 4 oz. can, \$1.00. Made by Pep Mfg. Co., Inc., 33 West 42nd St., New York, N. Y.

IGNITION TECHNIQUE

Announcement has just been made of the incorporation in Delaware of The De Jon Electric Corporation, manufacturers Ignition Technique. This is a \$50,000 corporation for the purpose of manufacturing a very

Patent Attorneys

INVENTORS desiring patents should read the treatise, "How to Reduce Your Invention to a Property Right," free on request. Lester E. Barrett, Patent Lawyer, Drawer 830, Washington, D. C.

PATENTS procured. Send sketch or model today for examination, prompt report and advice. No charge for preliminary advice. Write for free Booklet and blank form on which to disclose your idea. Highest references. Promptness assured. Clarence O'Brien, Registered Patent Lawyer, 750 Southern Bldg., Washington, D. C.

PROTECT YOUR RIGHTS—Write for "Records of Invention" and booklet about Patents. Prompt personal service. Advice without charge. J. Reaney Kelly, 612-E Columbian Building, Washington, D. C.

PATENTS SECURED—C. L. Parker, Patent Attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

DON'T LOSE YOUR RIGHTS to patent Protection. Before disclosing your invention to any one send for blank form "Evidence of Conception" to be signed and witnessed. Form and information concerning patents free. Lancaster & Allwine, 212 Ouray Building, Washington, D. C. "Originators of the Form Evidence of Conception."

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PATENTS. Write today for FREE instruction book and Evidence of Conception blank. Send sketch or model for examination and opinion; strictly confidential. No delay in my offices; my reply special delivery. Reasonable terms. Personal attention. Clarence O'Brien, Registered Patent Lawyer, 750 Southern Building Washington, D. C.

Distributors Wanted

Unusual opportunity for Special Distributor to add three new Ford lines of unusual merit. Write Accessory Department, Acme Belting Company, 107 West Canton Street, Boston, Mass.

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The "Colpin" magneto recharger for Ford cars clears all "SHORTS" in the magneto coil and recharges the magneto to full strength in less than 5 minutes without removing a single bolt or nut "No storage batteries needed," it operates from any alternating current light socket; will also operate from Farm lighting plants, Direct current circuit, storage batteries and dry cells. Nothing to wear out, No up-keep cost. Weight, 12lbs. Used and recommended by Authorized Ford Dealers.

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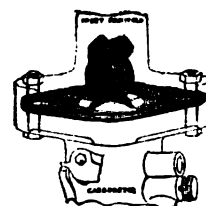
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"BABY" Hammerless Resolvers

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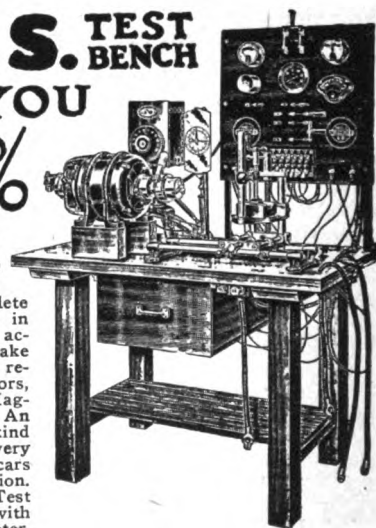
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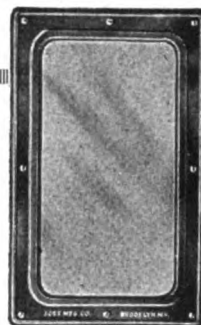
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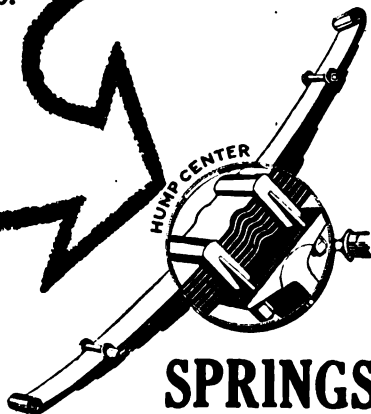
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760 Polk Street
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SPRINGS

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**Individually Cast
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Overlapping, Locked Joint
absolute proof against compression loss or oil leakage.

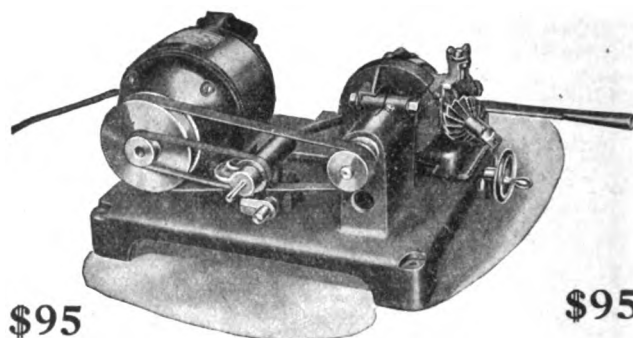
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any size**

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Two sizes cover every job—from $\frac{1}{4}$ inch on up to any given diameter.

A band of coldrolled ribbon steel—a bolt—a nut—a minute or two—and a perfect connection is made. Leak proof—permanent. Simple, yet immeasurably effective. No rough cutting edges. No injured hose.

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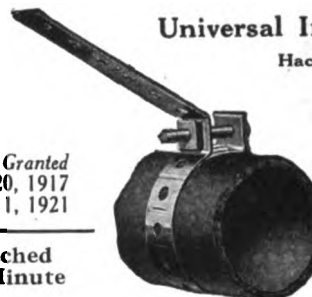
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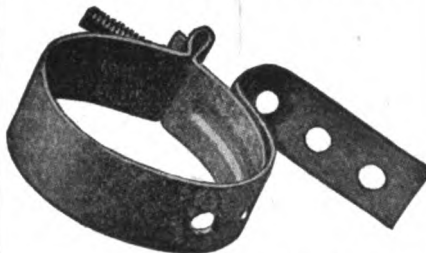
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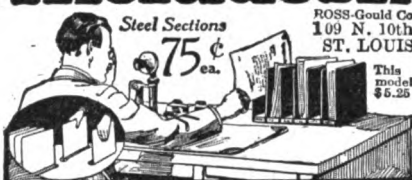
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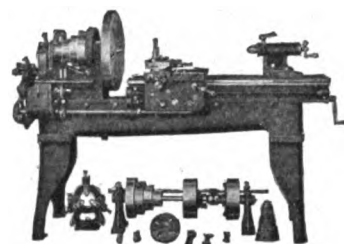
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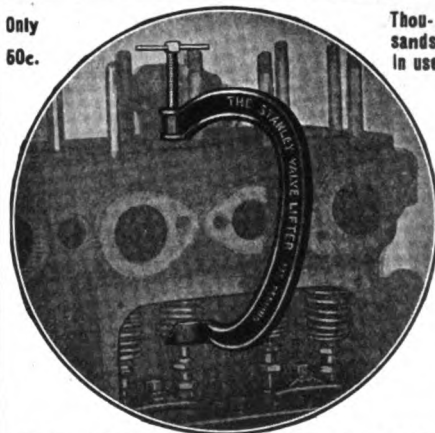
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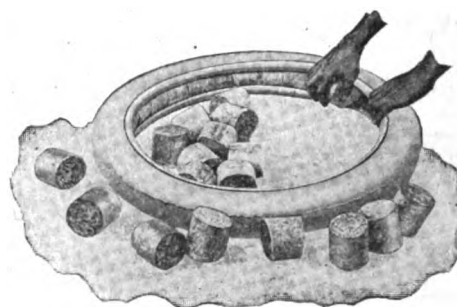
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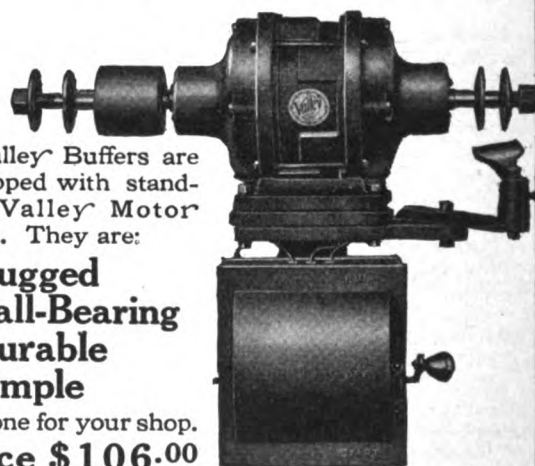
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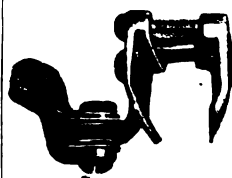


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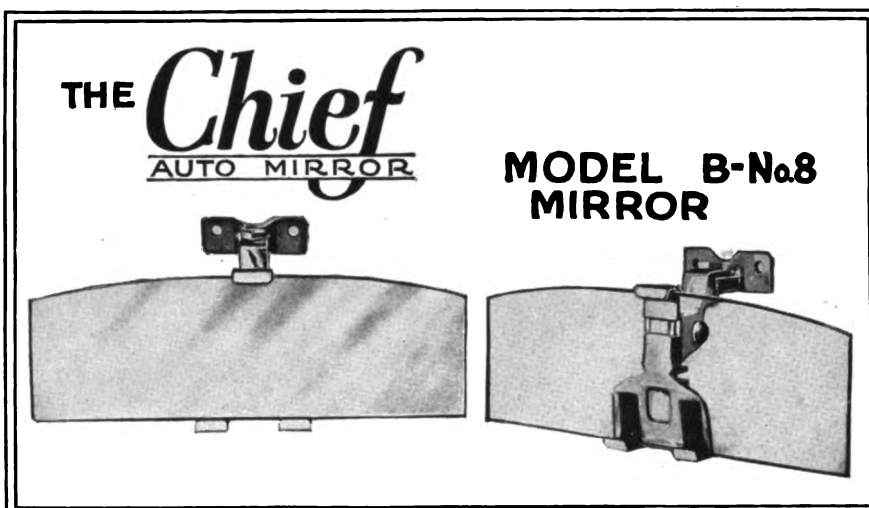
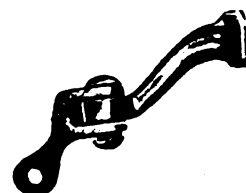
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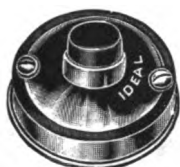
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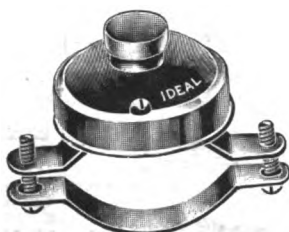


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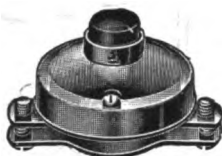
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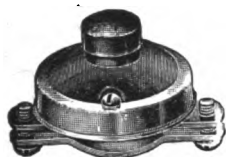
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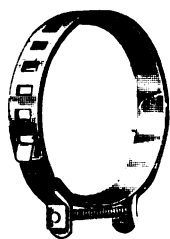


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